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Alternative Transportation Modes Feasibility Study
Volume III

Executive Summary

YELLOWSTONE
National Park • Wyoming

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Feasibility Study
Volume III

Executive Summary
July 1994

YELLOWSTONE
National Park • Wyoming

United States Department of the Interior • National Park Service • Denver Service Center
Prepared by BRW, Inc., in association with Dames & Moore

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This study has been prepared by BRW, Inc. and Dames and Moore under the direction of the Branch of Transportation, Denver Service Center, National Park Service. The study has been reviewed by the National Park Service and the U.S. Department of Transportation. Appropriate changes have been incorporated based on these reviews. NPS staff have provided assistance, review, and guidance during the course of the study. Special thanks are extended to the staff of Yellowstone National Park for their assistance in collecting and assembling the data used in the study. The staff of TW Recreational Services are also recognized for their contributions.

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PURPOSE

Section 1050 of the Intermodal Surface Transportation Efficiency Act of 1991, Public Law 102-240, directed that a study be conducted of alternatives to the private vehicle for visitor transportation in the national park system. Because of congressional intent and interest, the study used Denali National Park and Preserve and Yellowstone and Yosemite national parks as case study examples. Each of these park units has special transportation problems.

The major purpose of this study, as stated in the act, is to evaluate the following:

1. The economic and technical feasibility, environmental effects, projected costs, and benefits as compared to the costs and benefits of existing transportation systems, and general suitability of transportation modes that would provide efficient and environmentally sound ingress to and egress from national park lands; and
2. Methods to obtain private capital for the construction of such transportation modes and related infrastructure.

The study included an evaluation of specific alternatives to private vehicle travel in each of the three parks and a comprehensive inventory of transportation technologies that can serve visitor transportation needs within the national park system.

Transportation problems in the national park system are a cause for increasing concern. The issues leading to this study included the following:

- increasing traffic congestion in many park units, indicating a need for alternative transportation modes to enhance resource protection
- potential enhancement of the visitor experience and reduced vehicular congestion with the increased use of visitor transportation systems
- accelerating rates of deterioration of park roads from increased traffic, age, and lack of adequate maintenance funding
- rapidly expanding roadway construction and reconstruction needs

The information presented in this study is intended for use in the conceptual development and evaluation of alternatives to private vehicle travel in Yellowstone National Park. It provides a preliminary assessment of the feasibility of visitor transportation system options in the park. More in-depth engineering and environmental impact analyses of specific conditions will be required to confirm the cost estimates and to conform to the National Environmental Policy Act and other legislative requirements for proposed improvements in units of the national park system.

PREFACE

The results of the *Alternative Transportation Modes Feasibility Study* are presented in four separate volumes. This volume, Volume III, presents the findings of the feasibility study for Yellowstone National Park. Volume I provides an overview of transportation planning for national park units and an inventory of alternatives to private vehicle travel within parks. Volumes II and IV present the results of evaluations of alternative transportation systems for Denali National Park and Preserve and Yosemite National Park, respectively.

Throughout the *Alternative Transportation Modes Feasibility Study*, only those transportation technologies that have been proven in everyday use have been evaluated in detail. Volume I identifies emerging technologies that show the greatest promise for future application in the national park system. As these and other new technologies are developed and proven, a broader range of options may be available for use in park units.

The study has concentrated on transportation within and near Yellowstone. The transportation of visitors to the park from remote locations was not considered directly during this study. However, the National Park Service (NPS) recognizes the value of integrating the planning of transportation systems within the parks with the efforts of surrounding communities to address transportation issues. Visitor transportation systems in the parks must respond to transportation requirements that will vary depending on visitors' means of traveling to the parks.

Undoubtedly, many opportunities will be available to enhance the economic development potential of gateway communities and to reduce the impacts of transportation on park resources by providing innovative transportation systems based in the gateway communities. Such systems could be extensions of or complements to internal visitor transportation systems. A cooperative approach to visitor access and internal park transportation could enhance efforts to preserve regional ecosystems while improving the overall quality of visitor experiences in national parks.

The movement of visitors to and between attractions within parks accounts for the majority of travel within the national park system. Consequently, the resources available for this study have been concentrated on the question of how best to serve the transportation needs of visitors. Frequently, the transportation of NPS and concessioner employees is also an issue, especially at the larger park units. Specific planning efforts in each park unit should explore the opportunity to address both visitor and employee transportation needs with alternative transportation systems. The ability to serve both groups of travelers with a single system will depend on the location of employee housing, an issue that is outside the scope of this study.

Transportation planning for parks is but one element of a complete and systematic planning process that is conducted to determine the future of the nationally significant areas that have been set aside as units of the national park system. As urban planning professionals have recognized that effective land use and transportation decisions cannot be made independently, recreation and park planners and managers have increasingly embraced the idea of coordinated planning for resource management, visitor facilities, and transportation systems.

Transportation systems in national parks play a crucial role in determining the quality of visitor experience in the parks and have a strong influence on resource preservation. In developing transportation alternatives for Yellowstone and other units of the national park system, management and staff should consider how those alternatives can best support the broader purpose and values of the National Park Service and the individual park.

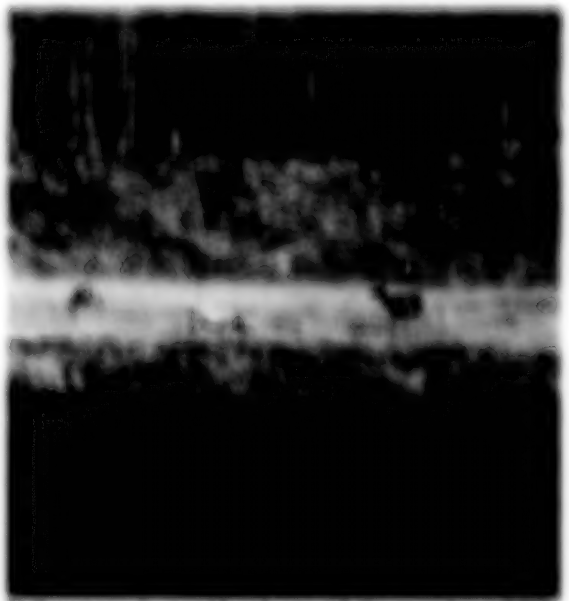
YELLOWSTONE OVERVIEW

Yellowstone National Park encompasses 2,221,722 acres within a mountainous plateau in the northern Rocky Mountains. The commanding features that initially attracted interest, and led to the reservation of Yellowstone as a national park, were geological — the geothermal phenomena, the colorful Grand Canyon of the Yellowstone, the fossil forests, and the size and elevation of Yellowstone Lake. With the establishment of the park road system known as the Grand Loop Road, the natural features and pristine conditions within the park became accessible to literally millions of people.

The entire Grand Loop Road lies within landscape settings of significant visual quality. Today, Yellowstone is considered one of the premier wildlife viewing units in the national park system. The pristine conditions; the striking geological, thermal, and hydrological features; and the presence and variety of wildlife all contribute to the outstanding visitor experiences offered by Yellowstone.

In addition to the natural resources of the park, Yellowstone contains significant cultural resources. There are 952 historic structures on the List of Classified Structures; of these, 553 have been determined to be eligible for listing or are listed on the National Register of Historic Places.

The Grand Loop Road network has contributed to the unique character of the park by providing visitors with a sense of freedom to explore the resources on their own terms, stopping at almost any location while using their own transportation. Visitors have the ability to enter and exit the park through any five gateways, each of which provides distinctive touring opportunities. A visitor survey, conducted in August 1993, revealed that only 23% of all visitors made trips through the park from one gateway to another.



Yellowstone is considered one of the premier wildlife viewing units in the national park system.

Current traffic volumes and road system limitations have resulted in recurring traffic congestion and long delays. To compound the congestion problems during the peak season, traffic backups associated with wildlife sightings are common. Visitors often stop their vehicles in a travel lane and leave them in pursuit of a better viewpoint.

In addition to presenting visitors with unpredictable and lengthy delays, congestion also adversely affects the administrative functions of the National Park Service and the concessioners. Park Service and concessioner employees, delivery drivers, law enforcement personnel, tour bus drivers, and passengers are all affected by disruptions in traffic flow.

Increasing traffic volumes, heavy vehicles, and severe winter weather have damaged road surfaces and accelerated erosion near roadways. A 1988 evaluation rated 28% of the Yellowstone road system in good or fairly good condition, with the remaining 72% rated fair to very poor. The *Parkwide Road Improvement Plan*, completed in 1992, calls for a long-term program of road improvements consisting of a combination of major reconstruction (MR) projects for severely deteriorated roadway segments and resurfacing, restoration, and rehabilitation (3R)

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projects to improve the condition and extend the life of other road segments in Yellowstone. A total of 112 miles of 3R and 164 miles of RR improvements are included in the plan.

As visitation has grown, the volume of traffic using the road system has approached the capacity of the existing roads. Expanding the roadway system to accommodate more vehicles would not be compatible with the preservation of the park's unique resources, since visitor crowding is now a problem at most popular activity areas and road widening could cause severe impacts to the park's natural environment.

During the peak visitation season, Yellowstone visitors, most of whom are family groups, tend to cluster in a few developed areas that are easily accessible by private vehicle, notably at the international icon of Old Faithful. Other popular summer destinations that receive substantial visitation and have related access problems include Canyon Village, Grant Village/West Thumb, Madison, Norris Geyser Basin, Mammoth Hot Springs, Fishing Bridge/Lake Village/Bridge Bay, and Tower-Roosevelt.

Transportation has been a prominent issue in Yellowstone for over two decades. Traffic volumes on roadways have continued to increase but funding for maintenance and rehabilitation has not kept pace with deterioration of the road system. Because of the heavy reliance on personal transportation, and the concentration of visitor use along the Grand Loop Road, congested conditions occur in many areas of the park.

This report describes opportunities to reduce the negative impacts of visitor traffic through the implementation of visitor transportation systems in major activity areas in Yellowstone National Park. Separating visitors from their vehicles poses many difficult challenges. Despite the obstacles, alternative modes of transportation may offer a viable means to protect resources and improve visitor experience in Yellowstone. The feasibility study developed alternatives to private vehicles on Yellowstone roads during the primary visitation period of May through October; it did not address options for winter travel.

The constant presence of vehicles can conflict with the natural character of Yellowstone.

In October 1992, study contractor and National Park Service staff met with representatives of the chambers of commerce of Cody and Jackson Wyoming, West Yellowstone Montana, and the staff of the Greater Yellowstone Coalition to identify study issues and to discuss the purpose of the study.

VISITATION

Peak Season

Yellowstone National Park is one of the most popular tourist attractions in the United States. Over 3 million people visited the park in 1992. Annual visitation has been steadily increasing over the last decade, as shown in figure ES-1.

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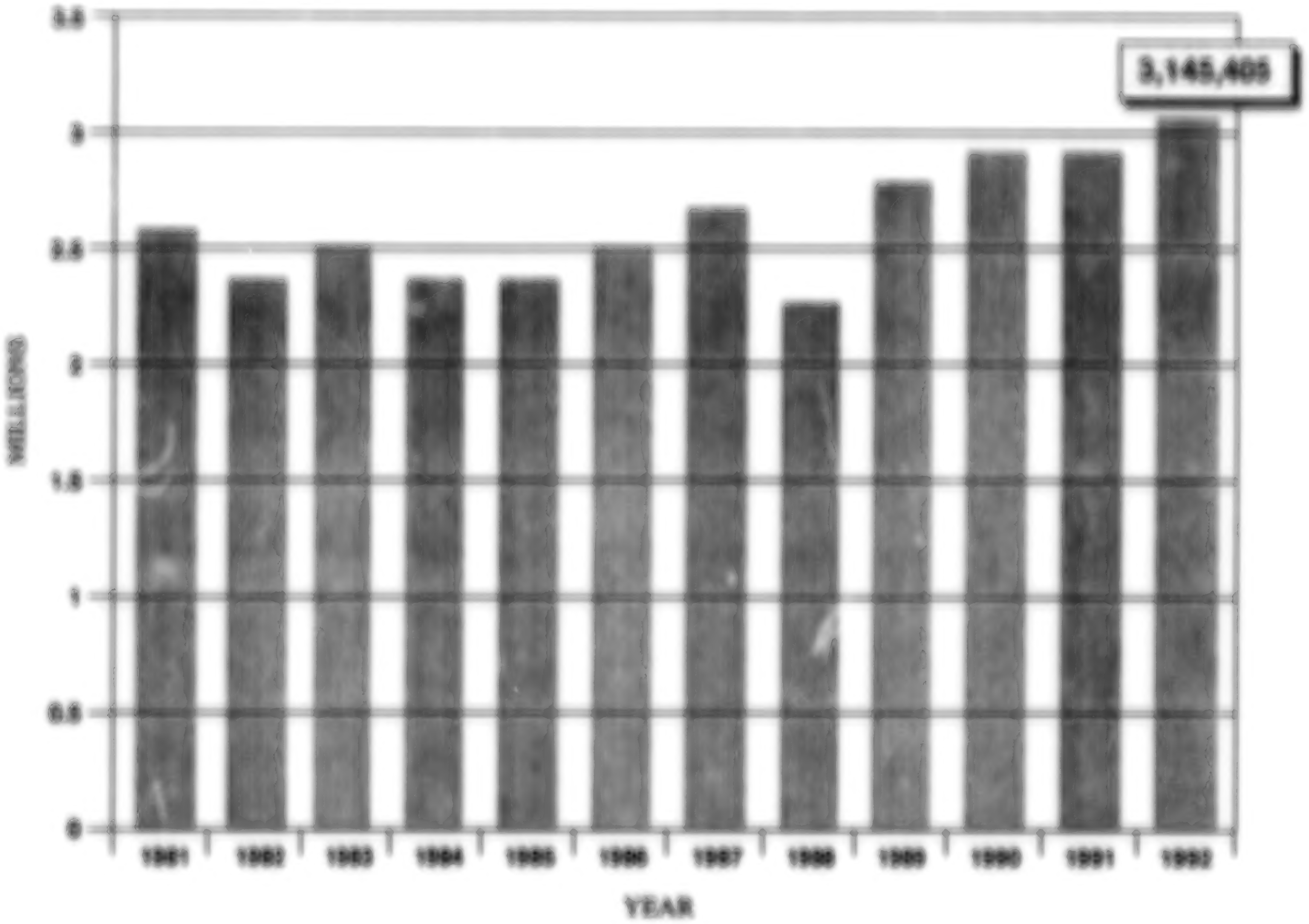
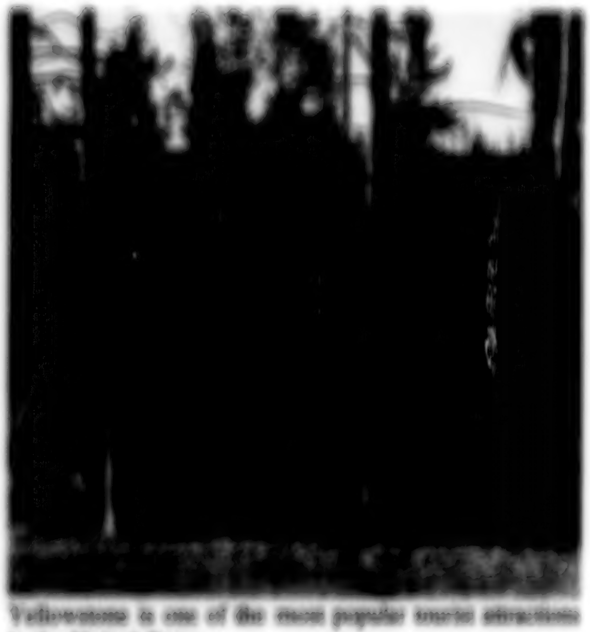
Figure ES-1: Yellowstone National Park
Annual Park Visitation



Source: Yellowstone National Park, Statement for Management, 1991 (1981-1990), Office of Visitor Services (1991).



Yellowstone is one of the most popular tourist attractions in the United States.

Visitation to Yellowstone increases gradually in the early spring as roadways are cleared of snow, and peaks in July and August. Figure ES-2 shows monthly visitation totals for 1991. Visitation during the peak months accounts for approximately two-thirds of the total visitation, as indicated in table ES-1.

During a typical summer day, 84% of Yellowstone visitors are clustered in the park campgrounds, thermal and scenic viewing areas, and the developed areas along the park roadways. Only 7% of visitors hike off the main roadways into the park backcountry. The Park Service estimates that 20,000 to 25,000 people are within the park during a typical peak season evening.

Non Peak Season

In the last two decades, visitation to Yellowstone during the "shoulder seasons" (the spring and fall periods before and after the peak summer season) has increased gradually. Although small in absolute terms, winter visitation to the greater Yellowstone area is increasing rapidly, nearly doubling in the last ten years. Recreational activities such as snowmobiling and ski touring have become popular. Table ES-2 shows that from 1990 through 1992 visitation during January through April accounted for about 3% of all park visits. From a base of no winter visits 30 years ago, the Park Service counted more than 140,000 visits to Yellowstone in the 1992-1993 winter season.

To date, maximum daily visitation levels have not been established for activity areas within the park. The capacity of transportation facilities generally dictate the limits of visitor use. On the busiest summer days, parking occupancy studies and traffic volumes indicate that visitation levels at Yellowstone are approaching the limits of efficient management in specific areas. Existing parking capacities, visitor center use estimates, and peak season average daily traffic counts were used to develop estimates of demand for the visitor transportation system (VTS) alternatives evaluated in this study.

TRANSPORTATION IN YELLOWSTONE

The Grand Loop Road system of Yellowstone National Park follows a rough figure-eight path. Roads leading from the park entrance stations intersect the Grand Loop Road at five locations. The west entrance station accommodates the greatest number of entries, with 34% of 1992 peak season traffic. The John D. Rockefeller, Jr. Memorial Parkway, linking Grand Teton Park to the south entrance of Yellowstone, is the next most popular, accounting for 26% of all visitors. The percentage of entering vehicles by station is shown in figure ES-3.

Although the northeast entrance currently receives the fewest park entries, planned improvements to the roadway system outside the park boundary may stimulate an increase in its use. The Chief Joseph Scenic Highway, between U.S. Highways 212 and 14/16/20 through the Sunlight Basin area, is being upgraded to a paved, all-weather facility. The improvements will provide a principal roadway

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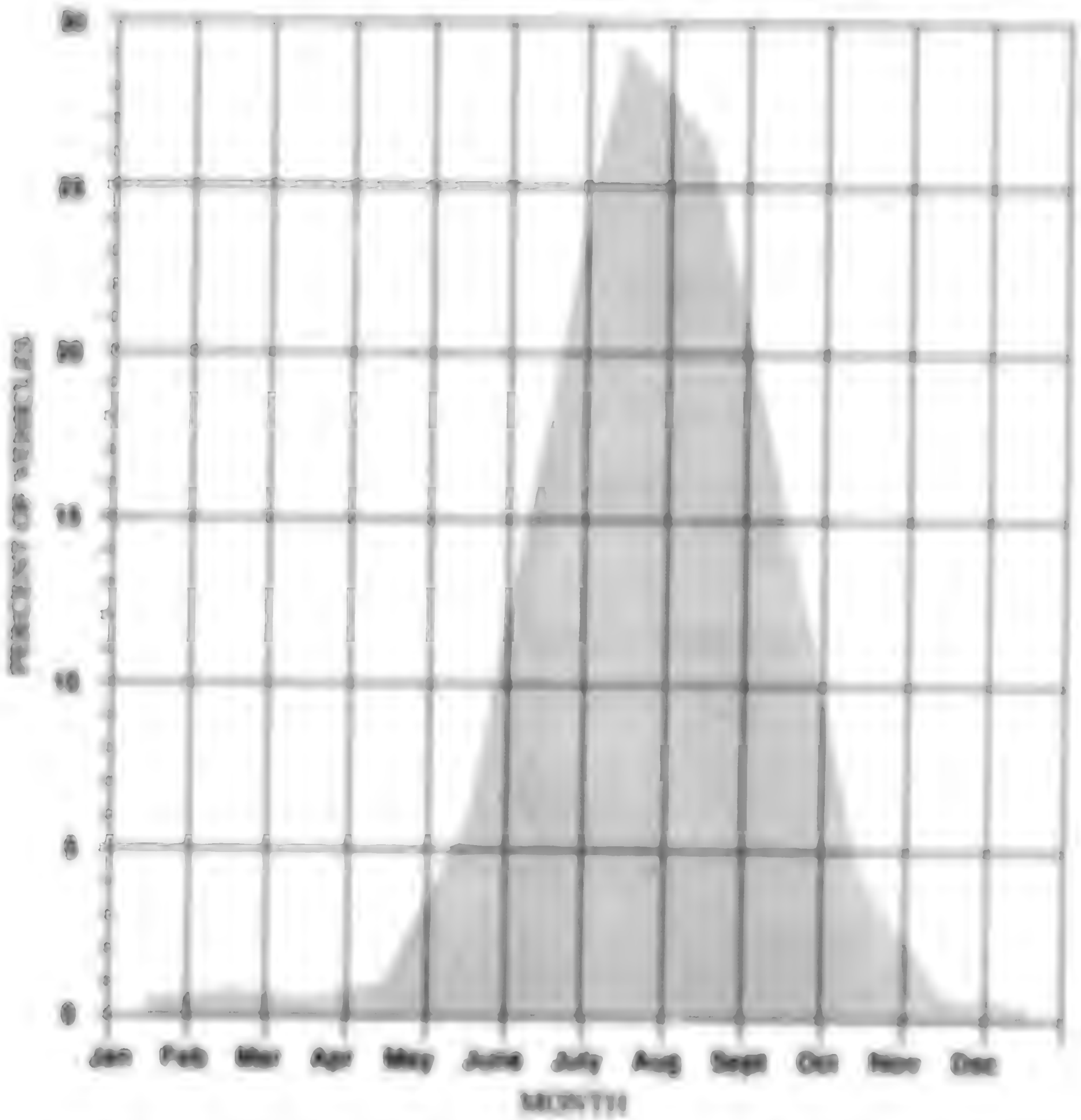
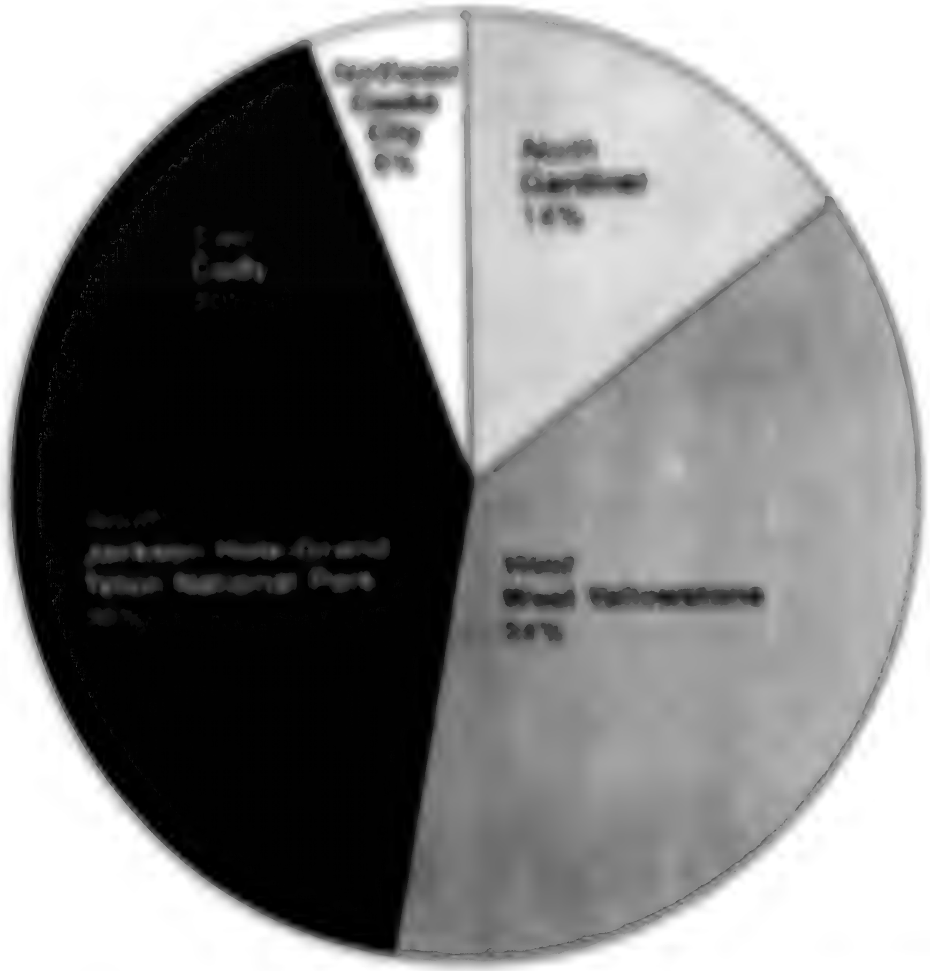
Figure ES-2: Yellowstone National Park
Year 1991 Monthly Park Visitation



Source: Yellowstone National Park, Office of Visitor Services, Cumulative Travel by Entrance Station Statistics

Figure ES-3: Yellowstone National Park
Year 1992 Vehicles Entering by Gate



Source: Yellowstone National Park, Office of Visitor Services, Cumulative Travel by Entrance Station Statistics

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Table ES-1: Peak Season and Total Annual Visitation

Year	Total Visitation	Visitation June-August	% of Total Visitation
1990	2,857,096	1,981,888	69
1991	2,957,836	2,038,146	68
1992	3,145,000	2,082,249	66

Source: Yellowstone National Park, Office of Visitor Services

Table ES-2: Winter Season Visitation As A Percentage of Total Visitation

Year	Total Visitation	Visitation January-April	% of Total Visitation
1990	2,857,096	79,384	2.7
1991	2,957,836	88,890	3.0
1992	3,145,000	95,184	3.2

Source: Yellowstone National Park, Office of Visitor Services, Cumulative Travel by Entrance Station Statistics

The west entrance has the greatest number of park entries.

link between Cody, Wyoming and Cooke City, Montana, and could possibly allow for year-round access to the northeast entrance of Yellowstone from the east. The roadways east of Cooke City are currently closed in the winter, requiring wheeled vehicles to reach Cooke City via Mammoth and the north park entrance exclusively. Improvement of the Chief Joseph Scenic Highway may also change summer visitor use patterns by facilitating loop tours from Cody through the east and northeast entrances.

The travel patterns of visitors within Yellowstone have a significant influence on the viability of VTS alternatives. A recent study found that over 80% of all Yellowstone visitors visited another national park as part of their trip. While inside the park, visitors typically want to see as much as possible in a short amount of time and most want to enter and leave the park at different entrances. As a result, many Yellowstone visitors could be greatly inconvenienced if they were required to stop at a location outside the park and use a visitor transportation system to reach activity areas in the park.

The principal alternatives to personal transportation available in Yellowstone are bus tours offered by TW Recreational Services (TWRS). A fleet of 41 concession tour buses provide access to all of the park's major developed areas along five routes. The tours range in round-trip length from 100 to 150 miles. The bus drivers provide interpretation of the park's history and significant features along the way. Although TWRS has designed the bus tours primarily to serve interpretive needs, there is some use of the buses for shuttle service between developed areas and lodging facilities. Almost 7,000 visitors took bus tours of Yellowstone in 1992. According to TWRS

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Tour vans are used by Grand Teton Lodge near Jackson, Wyoming.

officials, the number of tour bus passengers has declined in recent years.

In addition to the TWRS bus operations, three other private companies provide transportation services in the park under commercial use licenses. Summary totals of all bus passengers for 1990 and 1991 indicate that approximately 90,000 to 100,000 visitors entered Yellowstone in buses, representing approximately 3% of all park visitors.

Boat tours on Lake Yellowstone are available during the summer season. As many as eight one-hour rides are available from Bridge Bay during the summer season. Passenger demand has been fairly consistent from year to year, with an average of just under 200 passengers per day during the peak month. Rough water and unpredictable weather tend to limit cross-lake travel. These conditions would make it difficult to provide regular shuttle service between Bridge Bay and Grant Village on boats.

Although most transportation in the park between March and November is by private auto, truck, and recreational vehicle (RV), travel between December and February shifts to snowmobiles and snow coaches because most park roads are closed to wheeled vehicles. The majority of snowmobile trips and snow coach tours originate from West Yellowstone, at the park's west entrance station, and Flagg Ranch, several miles south of the park along the John D. Rockefeller Jr. Memorial Parkway. Winter season visitors and snowcoach passengers are accommodated in two lodging facilities operated by TWRS — the Old Faithful Snow Lodge and the Mammoth Hot Springs Hotel.

Average daily traffic (ADT) volumes in the park for the year 1992 are provided on the accompanying map. The highest seasonal average daily traffic (SADT) counts are at Old Faithful and in the Hayden Valley, with over 7,000 vehicles east of Old Faithful. Volumes along segments of the lower portion of the Grand Loop Road are higher than the upper sections. The lower loop provides the most direct connections between three of the busiest park entrance roads (west, south, and east). The segment of road between the northeast entrance and Tower-Roosevelt had the lowest SADT count along the loop in 1992, with approximately 3,000 vehicle trips per day.

Frequent interruptions to traffic flow are caused by visitors stopping to view wildlife, resulting in long lines of vehicles on nearly every roadway segment.

DEVELOPMENT AND SCREENING OF VTS ALTERNATIVES

Criteria were prepared to guide the development of transportation system alternatives, assist in the initial screening of alternatives to a small set of feasible options, and to compare the feasible alternatives for Yellowstone. The criteria were developed to respond to the study purpose as stated in the Intermodal Surface Transportation Efficiency Act and to account for the unique transportation problems and environmental conditions in Yellowstone. The criteria included essential requirements and a series of measures against which the alternatives could be compared.

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Essential Requirements

To be considered for detailed evaluation, transportation improvement alternatives for Yellowstone were required to have the following essential characteristics:

- Be able to accommodate estimated visitation or ridership levels in the areas to be served.
- Afford a meaningful reduction in private vehicle travel.
- Allow current visitor use patterns to continue, including the ability to conveniently visit more than one area of the park, enter and exit the park via different entrances, and allow visitors to experience a full range of scenic and wildlife-oriented activities.
- Have the potential to reduce vehicular emissions.
- Have the potential to reduce energy consumption associated with transportation.
- Maintain visual quality in key areas.
- Employ proven, available technologies for visitor transportation systems.
- Be capable of operating in a safe manner in the Yellowstone environment.
- Comply with the requirements of the Americans with Disabilities Act.
- Allow safe and unrestricted movement of wildlife across and along the transportation system corridors.
- Provide the opportunity for healing and improvement of existing road edge habitat.
- Have the potential to manage visitor encroachment into sensitive natural areas.

Evaluation Measures

Comparative measures for evaluation of those alternatives that met the essential requirements were developed in the following categories: visitor transportation and management, visitor experience, resource impacts, consistency with planning goals, cost and cost-effectiveness, and implementation.

Visitor Transportation Service Concepts

Because of the diverse travel desires of visitors to Yellowstone, a range of VTS service concepts are potentially viable. Among the possible concepts are:

- a parkwide mandatory transportation system
- a parkwide voluntary transportation system
- an entrance station to activity area shuttle
- a Grand Loop segment shuttle between activity areas
- an activity area circulator

Parkwide Systems. If a parkwide visitor transportation system was implemented, it would probably attract few passengers unless it was mandatory. This is because visitors typically travel through the park, visiting a number of activity areas and features and spending one or more nights on the way. Most visitors enter and exit via different entrance stations, which means that using a transportation system for a portion of their trip would involve a substantial amount of extra travel and an overall delay. Because travel by personal vehicle would be viewed as more convenient than travel by a visitor transportation system, only a mandatory system could be expected to attract significant ridership.

A mandatory transportation system would prevent through trips in Yellowstone, so

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visitors would have to travel to other destinations using routes outside the park. In most cases, this would add many miles and hours to existing through-trips. Although this would be a consequence of a mandatory transportation system, such a system was developed and evaluated to illustrate the magnitude of investment and the size of facilities that would be required to remove all private vehicular traffic from Yellowstone.

The mandatory parkwide transportation system analyzed in this study would interrupt all day use and overnight visitor traffic at staging areas near each of the five entrance stations. Passengers would be transferred at these locations to a visitor transportation system for all of their travel within the park.

Six transit routes were developed to provide visitor access to all of the major activity areas. With the proposed routes, each major activity area could be reached with a maximum of one transfer, except for certain trips from the northeast entrance that would require two transfers. The following routes (displayed on the Parkwide VTS Alternative map) were included in the a parkwide visitor transportation system.

- west entrance to east entrance via Canyon
- east entrance to west entrance via West Thumb
- north entrance to Madison Junction via Norris
- northeast entrance to north entrance via Tower
- south entrance to Madison Junction via Old Faithful
- Tower to Canyon via Dunraven Pass

Major transfer facilities, where visitors could change from one VTS route to another, would be provided at Mammoth, Tower-Roosevelt, Norris, Canyon, Madison Junction, Lake/Fishing Bridge, and West Thumb. Old Faithful, Grant Village, and Bridge Bay would also be included as major transit stops. Additional activity areas along each route would be served by on-demand stops.

Motor coach buses were chosen to provide the service because they represent the most economical technology to provide service on the nearly 350 miles of two-way route that would need to be covered under this alternative. Buses would also offer the best opportunities for on-demand stops and would allow visitors to reach trailheads and other minor destinations. A cog rail system was selected to provide service on the Dunraven Pass route because of the steep grades and the poor condition of the existing road.

A mandatory parkwide visitor transportation system would influence two primary quantifiable aspects of visitor use and park management. First, large long term parking areas would be required at each entrance station. Second, in order to provide adequate capacity and convenient service to visitors, the VTS fleet would be large, and operating costs would be considerable.

A mandatory visitor transportation system would cause long delays to visitors coming to Yellowstone as part of larger travel itineraries that involve entering the park at one gate and leaving from another. Facilities for overnight accommodation reservations and confirmations, and visitor information and orientation, would be needed at each staging area. The system would also need to accommodate visitor luggage and equipment. Moving camping gear to camp sites would present a difficult challenge, and visitors arriving in recreational vehicles would be poorly served.

Table ES-3 provides a summary of the parking facilities and transit equipment needed for a mandatory parkwide transportation service. The passenger demand for the service was estimated based on 1992 peak season average daily traffic volumes into and within the park.

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Table ES-3: Costs and Operating Requirements for Parkwide VTS Routes

Requirements	West to East (via Canyon)	East to West (via West thumb)	North to Madison Junction (via Norris)	Northeast to North (via Tower)	South to Madison Junction (via Old Faithful)	Tower to Canyon (via Dunraven Pass)	Total System
Parking Spaces	3,411	3,208	1,783	1,711	2,902	NA	13,015
Parking Lot Area (acres)	37.9	33.6	19.8	19.0	32.2	NA	143.5
Round Trip Route Length (km)	171	193	80	85	116	38	683
Transit Vehicles	238	216	59	65	129	31	738
Peak Period Service Intervals (min.)	2.0	2.5	4.0	3.75	2.5	6.0	
Construction and Equipment Costs (millions)	$81.3	$74.0	$22.6	$24.2	$46.8	$283.0	$531.9
Seasonal Operating and Maintenance Costs (millions)	$21.4	$20.1	$5.6	$6.3	$12.0	$7.2	$72.6
Annualized Cost Per Peak Season Visitor							$18.48

Source: BRW, Inc.

Notes: - Costs represent total costs (contingency, planning and supervision percentages applied where appropriate) for vehicle fleet, rail alignment and parking spaces only

- Staging areas located at first entrance name in route titles

- NA = Not Applicable

The costs presented in table ES-3 do not include support facilities and are based on different operating concepts than those developed for the individual visitor transportation systems described later in this Executive Summary.

Because of the magnitude of the required investment, the impacts on natural resources of building large parking lots, the high operating and maintenance costs, and the disruption of existing visitor use patterns associated with a parkwide transportation system, this alternative was not carried forward into detailed analysis. A more cost-effective approach to reducing the negative impacts of visitor transportation would involve focusing investments in visitor transportation systems in those areas that have concentrated visitor use and sensitive and significant resources.

The following paragraphs discuss the development of VTS alternatives for each of the VTS service concepts not involving a parkwide system.

Entrance Station to Activity Area Shuttle. This service concept would be most applicable at entrance stations where visitors travel to and from the entrance station. It would be most appropriate as a voluntary system. The best opportunity for travel to and from a single station would occur at the north and west entrance stations. The presence of nearby lodging facilities, which act in part as overflow capacity for Yellowstone, the greater number of overnight rooms, the higher overall entrance volume (34% of all entries occur at the west entrance station and 14% of all entries occur at the north entrance station) and the convenient access to Old Faithful (which attracts 25,000 daily visitors) make the west entrance the most appropriate location for implementation of this VTS concept. Grant Village/West Thumb could provide a secondary staging area and route terminal for a transportation system from the west entrance to Old Faithful, potentially capturing some visitors entering Yellowstone from the south.

Grand Loop Segment Shuttle. Nine individual road segments comprise the Grand Loop Road. Several of the segments traverse important wildlife habitats and other environmentally sensitive areas. The character of the surrounding terrain varies widely, from alpine mountain slopes on Dunraven Pass to wooded streamside valleys on many other segments. Because of the heavy volume of traffic throughout the park and the resulting likelihood of delays on a bus-based transportation system, a system providing service along a portion of the Grand Loop Road would be most effective as a mandatory system. The following characteristics were considered desirable for a potential transportation system of this type:

- potential reduction in vehicular impacts on sensitive wildlife habitats
- potential to afford a special visitor experience, including views of wildlife and natural landscapes
- acceptable impacts on major park features by private vehicles
- ability to support park and visitor use management goals

Two Grand Loop road segments provide the best opportunities for VTS implementation:

- Lake/Fishing Bridge to Canyon (Hayden Valley)
- Canyon to Tower (Dunraven Pass)

The road segment through Hayden Valley traverses one of the most sensitive wildlife habitats in Yellowstone, with expansive meadows and river-edge environments. It also crosses major wildlife migration routes bounded by Yellowstone Lake and the Grand Canyon of the Yellowstone River. Having one of the highest traffic volumes of all road segments, the Hayden Valley portion of the

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Grand Loop Road would offer substantial visitor experience and resource preservation benefits if closed to private vehicular travel.

The Dunraven Pass road segment has some of the worst road deterioration problems in Yellowstone. It is unique among the park's road segments because of its high mountain setting and expansive views. Dunraven Pass road may not be cost-effective to reconstruct because of its low traffic volumes. Closing the road to private vehicles and providing a fixed-guideway transit line (most likely a cog railway) would provide a potentially viable option to the possible closure of this segment to visitor access or costly reconstruction of the road to bring it up to a reasonable standard of safety and ride quality.

Activity Area Circulator Systems. Two of the park's activity areas may offer viable opportunities for relatively short circulator systems affording access to scattered viewing and activity areas. The three most-visited activity areas are Old Faithful, Canyon, and Grant Village/West Thumb. Of these, the Canyon area is best suited for a visitor transportation system, considering the locations of and distances between the viewpoints along both the north and south rims of the Grand Canyon of the Yellowstone. A service similar to that provided along the west rim of Grand Canyon National Park could be implemented at Canyon.

Old Faithful, with 25,000 daily visitors and a number of secondary thermal features, offers another viable area for circulator service. A visitor transportation system which would provide access to the Midway Geyser Basin and other features north of Old Faithful could help to smooth traffic flows over time and reduce parking capacity problems at the smaller features.

Visitor uses and travel patterns at Grant Village/West Thumb, the third most visited area of Yellowstone, are not well-suited for a visitor transportation system.

Viewpoints at the Grand Canyon of the Yellowstone could be served conveniently by a visitor transportation system.

FINAL TRANSPORTATION ALTERNATIVES

The final alternatives developed for detailed assessment are described below. The Candidate Areas for Transit Service map on the following page illustrates the location of each alternative within the park. Individual maps and charts at the end of the "Executive Summary" present the specific routes and essential service requirements for each option.

West Yellowstone to Grant Village (via Old Faithful)

One VTS alternative was developed for this area. A voluntary shuttle bus system would link West Yellowstone and Grant Village. The system would serve the Old Faithful area plus other popular geyser basins and trailheads along the route. The service frequency would be 15 minutes during the peak period and 30 minutes during the off-peak periods. Stops would include access points along the Madison River, Madison Junction, Fountain Paint Pots, Midway Geyser Basin, Biscuit Basin, Black Sand Basin, Old Faithful, Kepler Cascades, Delacy Creek, and West Thumb. Visitor

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parking would be provided in West Yellowstone and at Grant Village. Approximately 200 vehicle spaces would be needed to serve the projected demand at each end of the route. An existing surplus of 78 spaces at the Grant Village visitor center could reduce the parking requirement to 122 spaces at that location. A number of staging area options exist for West Yellowstone. A representative site near the airport (northwest of town) was considered for this alternative.

The chart accompanying the map for this alternative presents an overview of the service that could be provided and the equipment requirements for the shuttle bus system.

Hayden Valley (Lake to Canyon)

Four VTS alternatives were developed for this area. The alternatives are identical in route length, number of stops, and the location and size of auxiliary parking areas. The difference between the alternatives is in the type of transit technology that would be used.

The alternatives included:

- shuttle using conventional bus
- shuttle using articulated bus
- elevated monorail or other group rapid transit (GRT) technology
- self-propelled rail transit

Under all of these alternatives, the roadway would be closed to private vehicular traffic, and transit usage would become mandatory. This action would result in a 90% decrease in daily traffic through the Hayden Valley. Both the elevated monorail and self-propelled rail transit alternatives would require new guideways. A service road for maintenance, law enforcement, and emergency vehicles would be needed near this system. The monorail GRT option would require an electrical power supply along its guideway.

Staging areas would be located at both Canyon and Lake Village for this service. A total of 683 auto and recreational vehicle (RV) parking spaces would be required at Canyon to accommodate the projected demand. By using an existing surplus of 124 spaces, only 559 new parking spaces would be required. These parking requirements reflect the demand associated with a Hayden Valley transit service only. Parking for a possible Canyon area circulator is included under a separate alternative.

A self-propelled rail system could reduce impacts on the wilderness character of Yellowstone.

The Lake Village staging area would require about 893 auto and RV spaces. A larger number of spaces would be needed here because visitors would be expected to spend more time in the Canyon area as part of their round-trip.

The map and chart at the end of the "Executive Summary" provide an overview of the equipment and facilities that would be required for each of the transit alternatives for Hayden Valley.

Dunraven Pass (Canyon to Tower)

Two alternative VTS technologies were identified for this segment:

- shuttle using conventional or large buses
- cog railway

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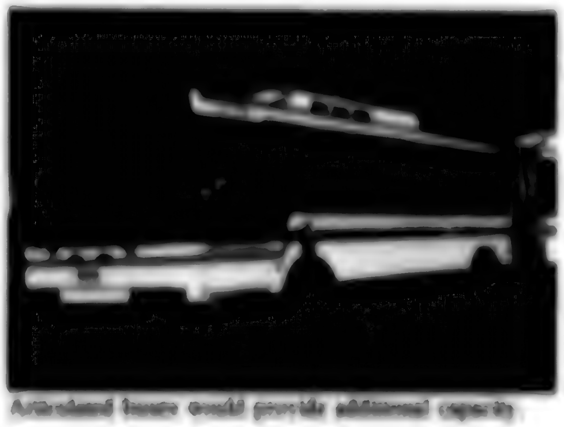
Conventional bus transit could serve visitor needs.



Articulated buses would provide additional capacity.

Both systems would operate between the Canyon Village area and the Tower-Roosevelt area with interim stops at Mt. Washburn Road and Tower Fall. Visitors to Mt. Washburn would hike from a stop on the VTS route.

Either transit technology would permit access to other trailheads along the Dunraven Pass road segment. The roadway would be closed to visitor traffic, and transit use would be mandatory in both cases. The cog railway alignment could be constructed on or adjacent to the existing roadway alignment. A narrower road could be retained for service vehicles, or utility vehicles could be operated on the cog railway.

Staging areas would be located at both Canyon and Tower to support service on the Dunraven Pass segment. Passengers originating at Tower would probably spend more time on their round trip because of the many activities available at Canyon. A total of 612 auto and recreational vehicle spaces would be needed to serve the estimated demand at Tower, and 476 spaces would be needed at Canyon. Using the existing surplus of 124 spaces at Canyon would result in a requirement for 352 new spaces. A common staging area and maintenance facility could be shared at Canyon if the Hayden Valley and Canyon area transportation systems also were implemented.

The map and chart at the end of the "Executive Summary" summarizes the key aspects of the Dunraven Pass alternatives.

Grand Canyon of the Yellowstone Area

Three alternatives were identified for this area. The north rim shuttle bus alternative would involve closing North Rim Drive from the camper services facility to the intersection with the Grand Loop Road near Lower Falls view. Private vehicle access to the overlook and trailhead parking areas would be eliminated and visitors would be shuttled to each vantage point from a parking lot located in the Canyon Village area.

A combination of 124 surplus spaces and 559 new parking spaces would provide the necessary total of 683 vehicle spaces for automobiles and RVs in Canyon Village. The north rim VTS alternative could also share a staging area and maintenance facility with the south rim, Hayden Valley, or Dunraven Pass systems.

Shuttle buses would transport passengers from the Canyon Village staging area to Inspiration Point, Grandview, Lookout Point, and the Brink of Lower Falls along North Rim Drive. Passengers would depart and board the buses in the areas where private vehicle parking is

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An elevated monorail system may provide visitor appeal.

currently offered. Buses would operate at frequent intervals to allow visitors to walk to different locations or re-board after sightseeing. Shuttle stops would also provide a link with the Canyon hiking trail system.

Alternatives 2 and 3 would provide service to the south rim. Alternative 2 would use shuttle buses while Alternative 3 would use an elevated monorail GRT system. For the bus alternative, the service would start at the Upper Falls lot and proceed to the south drive via the Grand Loop Road. For the monorail system, service would operate between Wapiti Trailhead and Artist Point, with a stop at Uncle Tom's Trail. The south rim roadway would be closed to visitor traffic beyond Uncle Tom's Trail under both alternatives.

A total of 185 additional parking spaces at Upper Falls view, Wapiti Trailhead, and Uncle Tom's Trail would be required to support the bus alternative. The combined total of 260 existing spaces at the three lots would provide over half of the total estimated requirement of 445 spaces.

A total of 270 parking spaces would be needed to serve the estimated demand of a monorail alternative. Parking demand would be less for the monorail because of its shorter route and duration of stay. The 170 existing parking

A cog rail system could be used to carry visitors over Dunraven Pass.

spaces at Wapiti Trailhead and Uncle Tom's Trail could be used, along with 100 new spaces. The south rim VTS alternatives could potentially share a maintenance facility and staging area with other transportation systems serving the Canyon area.

For the purposes of this study, north and south rim transportation systems were evaluated separately. These alternatives could also be combined.

The map and chart at the end of the "Executive Summary" summarize the Canyon area transit alternatives.

Old Faithful/Geyser Basin Area

Two circulator bus alternatives were identified and developed for this area. Alternative 1 would use conventional buses, and Alternative 2 would use articulated buses. The buses would leave from Old Faithful and travel to Firehole Lake Drive, with stops at Black Sand Basin, Biscuit Basin, Midway Geyser Basin, Great Fountain Geyser/White Dome Geyser, Firehole Lake, and Fountain Paint Pots. These features currently have small parking areas. Visitors are frequently forced to pass them by or park along the narrow road edge when parking lots are at capacity. Using a staging

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area at Old Faithful, visitors could be shuttled to view these resources, reducing parking demand in these crowded areas.

Under this alternative, the existing road could be closed and obliterated/reclaimed north of Fountain Paint Pots. Traffic could be rerouted to the west on Fountain Freight Road. Visitor traffic could be restricted from using the old road north of Midway Geyser Basin and on Firehole Lake Drive. Private vehicle parking could be eliminated at Black Sand Basin, Biscuit Basin, Midway Geyser Basin, and Fountain Paint Pots Trail.

Unused parking spaces at the Old Faithful development could be used for a transit staging area. A surplus of 141 spaces was identified in the west lot at Old Faithful. An additional 734 spaces would provide the required total of 875 cars and RV spaces required for the visitor transportation system serving the Geyser Basin area.

The fleet and facility requirements for the bus technologies are provided on the chart accompanying the map of the Old Faithful/Geyser Area transit route at the end of the "Executive Summary".

EVALUATION SUMMARY

The evaluation charts at the end of the "Executive Summary" provide a comparison of the Yellowstone VTS alternatives in six evaluation categories. The following paragraphs highlight the most important results of the evaluation process. Tables summarizing the costs of each alternative are also provided. The cost estimates for bus-based VTS alternatives do not reflect roadway rehabilitation or increased roadway maintenance, which may be required to support the transit service. The fixed guideway alternatives may also have additional costs associated with retaining or removing existing roadways.

West Yellowstone to Grant Village (via Old Faithful)

This alternative would attract relatively few riders; however, it would encourage the development and use of visitor support facilities outside the park, including potential investments being considered by TWRD. Of the possible remote staging and shuttle options to Yellowstone, this alternative would have the best chance of success due to the concentration of lodging units near the west entrance station and in Grant Village and the connection the system would provide to Yellowstone's most visited feature — Old Faithful. The west entrance to Yellowstone has the highest percentage of existing vehicles which had entered at the same location - 30% in a 1993 survey. A reduction in the number of personal vehicles through the Madison River corridor could help reduce the potential for wildlife disruption and the degree of roadside

Table ES-4: Cost Summary for West Yellowstone to Grant Village

Cost Element	Motor Coach Shuttle Bus
Construction and Equipment (millions)	$6.4
Annual Operating and Maintenance (millions)	$1.0
Annual Passengers	217,700
Annualized Cost Per Rider	$13.13

Source: BRW, Inc.

Note: - Equipment total costs represent a net cost estimate plus 10% for contingencies. No supervision or planning cost percentages are applied.
- Facility total costs represent a net cost estimate plus 10% (of net) for contingencies, 15% (of net) for supervision and 10% (of net) for planning.

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habitat deterioration. The cost for the West Yellowstone shuttle bus alternative is presented in table ES-4. In addition to the costs shown in the table, housing costs for VTS employees would total $0.9 million.

Hayden Valley (Lake to Canyon)

Development of a visitor transportation system in Hayden Valley could reduce vehicular impacts on wildlife and fragile habitat in an especially sensitive area of Yellowstone. Such a system could provide visitors a unique and pleasant way to experience wildlife in a natural setting. A monorail system would isolate visitors from the environment, minimizing the impact of visitor use on the resources of the Hayden Valley. The monorail also would offer visitors a unique and exciting viewing perspective. Although a large structure would be placed in the landscape, the majority of visitor viewing would be from the vehicles, minimizing the actual visual impact of the system. The monorail alternative would cost substantially more than the other Hayden Valley VTS alternatives and might require an upgrade of the park's electrical transmission system. Costs for each alternative are summarized in table ES-5. Housing costs for VTS employees would total $1.3 million to $3.3 million.

Dunraven Pass (Canyon to Tower)

This segment of the Grand Loop Road has relatively low visitation. The condition of the road is poor and maintenance is difficult. The development of a cog railway system along the current road alignment would address some of the existing maintenance concerns. The visitor appeal of such a system could increase visitation and improve the cost-effectiveness of the cog railway option.

Bus service along this road segment would require road improvements and continued maintenance. The ridership potential of the bus options is probably lower than that for the cog railway, potentially affecting the cost-effectiveness of these alternatives. Development of either type of transportation system along this segment would help to reduce traffic volume and associated disturbance to wildlife and roadside habitat. Table ES-6 summarizes the costs for each of the three Dunraven Pass transit options. A total of $1.6 million to $2.5 million in housing costs for VTS employees would be associated with the alternatives analyzed for Dunraven Pass.

Canyon Area Shuttles

Visitor transportation systems in this compact activity area would cost less than in other locations because VTS routes would be short. The primary benefit of systems in the Canyon area would be removing traffic and parking from the scenic areas along the rims. Access to viewpoints would be easier because visitors would not have to search for parking spots at individual viewpoints. VTS service would permit visitors to take short walks between viewpoints and would offer a different type of experience from the typical Yellowstone private vehicle tour. The monorail option would reduce noise and VTS emissions, but could disrupt views of and from the rims.

The cost of the Canyon area VTS alternatives are presented in table ES-7. Housing costs for Canyon VTS employees would range from $0.2 million to $0.6 million.

Old Faithful/Geyser Basin Shuttle

This alternative could reduce the peaks in visitor traffic which occur after Old Faithful eruptions. Congestion in the Old Faithful area, on the Grand Loop Road, and at the thermal features near Old Faithful could be reduced by offering a service that would encourage visitors to stay longer. The parking demand at the various thermal features along the roads north of Old Faithful would be reduced. The access to the thermal features would be more difficult for through travelers with a limited amount of time to view the park if all parking were eliminated at each thermal area. Table ES-8 summarizes the costs for the two bus types evaluated for this service. VTS employee housing would cost between $1.0 million an $1.2 million.

IMPLEMENTATION

With costs ranging from $1.26 to more than $75.00 per passenger, the VTS alternatives identified for Yellowstone would need to be

Table ES-5: Cost Summary for Hayden Valley Alternatives

Cost Element	Conventional Shuttle Bus	Large Shuttle Bus	At-Grade Self-Propelled Rail	Elevated Monorail
Construction and Equipment (millions)	$31.1	$34.3	$348.6	$880.7
Annual Operating and Maintenance (millions)	$5.1	$3.6	$8.6	$5.7
Annual Passengers	1,021,200	1,021,200	1,021,200	1,021,200
Annualized Cost Per Rider	$7.98	$6.80	$36.79	$75.78

Source: BRW, Inc.

Note: - Equipment total costs represent a net cost estimate plus 16% for contingencies. No supervision or planning cost percentages are applied.

- Facility total costs represent a net cost estimate plus 16% (of net) for contingencies, 15% (of net) for supervision and 25% (of net) for planning.

Table ES-6: Cost Summary for Dunraven Pass Alternatives

Cost Element	Conventional Shuttle Bus	Large Shuttle Bus	Cog Railway
Construction and Equipment (millions)	$23.1	$29.7	$362.0
Annual Operating and Maintenance (millions)	$3.8	$3.2	$6.9
Annual Passengers	657,700	657,700	657,700
Annualized Cost Per Rider	$9.14	$9.24	$55.87

Source: BRW, Inc.

Note: - Equipment total costs represent a net cost estimate plus 16% for contingencies. No supervision or planning cost percentages are applied.

- Facility total costs represent a net cost estimate plus 16% (of net) for contingencies, 15% (of net) for supervision and 25% (of net) for planning.

supported by a new dedicated funding source. Potential sources include funding provided in Intermodal Surface Transportation Efficiency Act; line-item appropriations as part of the NPS budget; participation by the park concessioner; and user charges, which would be most effective if collected as part of the entrance fee. The systems would attract the most ridership if fares were not charged; as a result, direct user charges are not recommended. Private sector participation would depend on the potential for the investment to be recovered through direct or indirect user charges or increased revenues from the sale of other goods and services. Public sector investment in VTS alternatives for Yellowstone could be considered as part of a larger strategy to preserve important park resources.

Despite the obstacles, visitor transportation systems might be a viable means to achieve many desirable objectives in the management of visitation to and within Yellowstone. These systems could shift the emphasis from

Table ES-7: Cost Summary for Canyon Area Alternatives

Cost Element	North Rim Conventional Shuttle Bus	South Rim Conventional Shuttle Bus	South Rim Elevated Monorail
Construction and Equipment (millions)	$6.5	$4.9	$93.4
Annual Operating and Maintenance (millions)	$0.8	$0.6	$0.4
Annual Passengers	1,105,700	737,100	737,100
Annualized Cost Per Rider	$1.26	$1.49	$10.95

Source: BRW, Inc.

Note:
- Equipment total costs represent a net cost estimate plus 16% for contingencies. No supervision or planning cost percentages are applied.
- Facility total costs represent a net cost estimate plus 16% (of net) for contingencies, 15% (of net) for supervision and 25% (of net) for planning.

Table ES-8: Cost Summary for Old Faithful to Geyser Basin Alternatives

Cost Element	Conventional Shuttle Bus	Articulated Shuttle Bus
Construction and Equipment (millions)	$12.2	$16.1
Annual Operating and Maintenance (millions)	$2.6	$2.3
Annual Passengers	850,500	850,500
Annualized Cost Per Rider	$4.39	$4.48

Source: BRW, Inc.

Note:
- Equipment total costs represent a net cost estimate plus 16% for contingencies. No supervision or planning cost percentages are applied.
- Facility total costs represent a net cost estimate plus 16% (of net) for contingencies, 15% (of net) for supervision and 25% (of net) for planning.

providing facilities and services for private vehicle use to focusing more on the needs of people. The practice of modernizing and widening the roads and enlarging parking lots for more traffic should be carefully considered. Public transportation could deliver visitors to in-park locations in more predictable numbers based on the carrying capacity of the park resources and could provide in-vehicle interpretation. More control could be exercised over human/animal interactions, at least in the most sensitive habitat areas of the park. Unique and fragile geothermal, archaeological, and historic resources could be better protected.

Improved safety and less need for law enforcement and traffic management work by park staff would be likely outcomes of reduced reliance on private vehicles for visitor transport.

The development of VTS alternatives in portions of Yellowstone would also provide the potential for a broader range of visitor experiences. At present, nearly all visitor exposure to the park involves private vehicle trips and short walking excursions through developed areas. Vehicle travel is frequently under congested conditions in long lines of cars and RV's. VTS services could offer a distinctly different type of experience, if significant reductions in private vehicular trips could be achieved.

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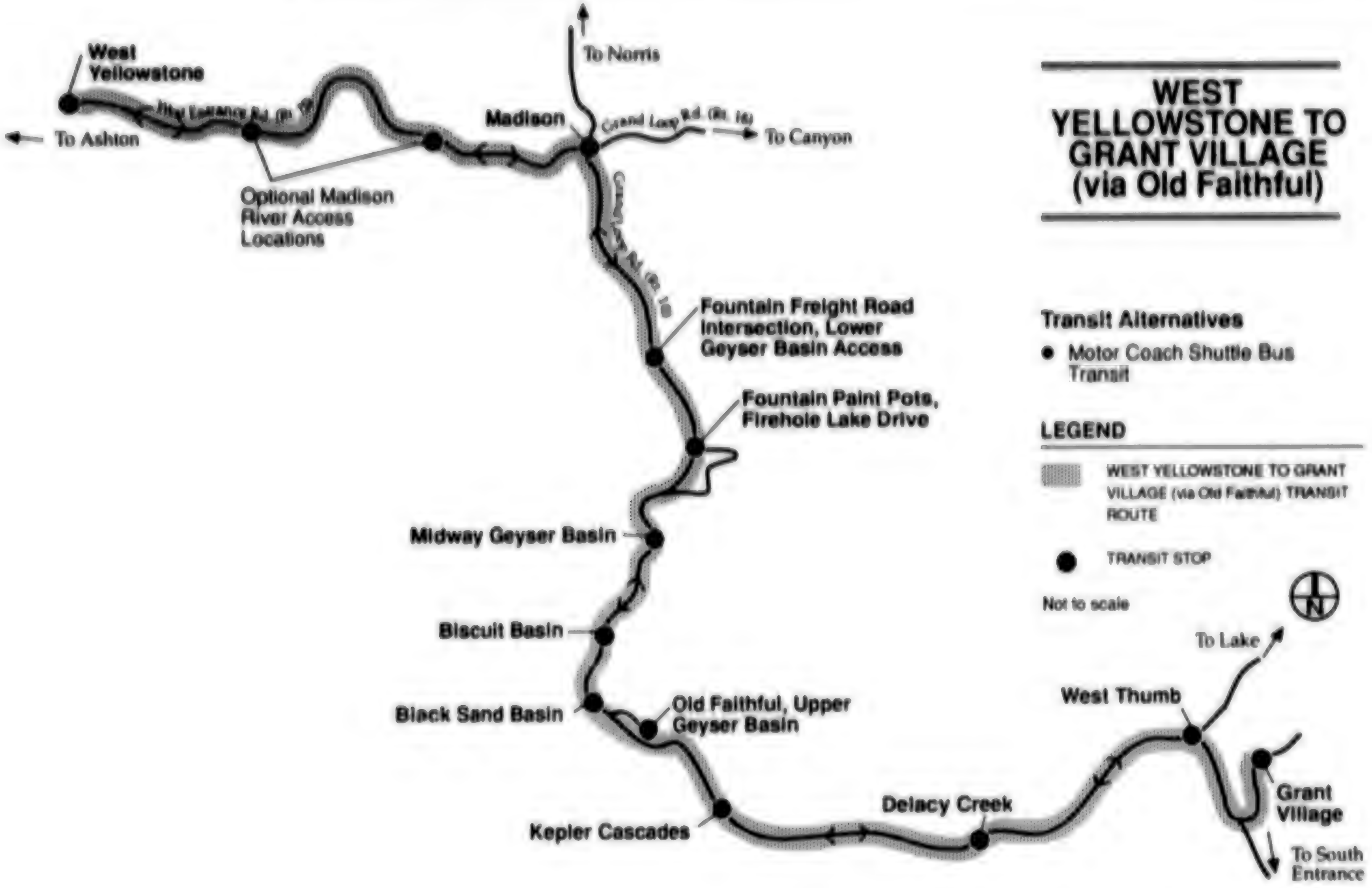
WEST YELLOWSTONE TO GRANT VILLAGE (via Old Faithful)



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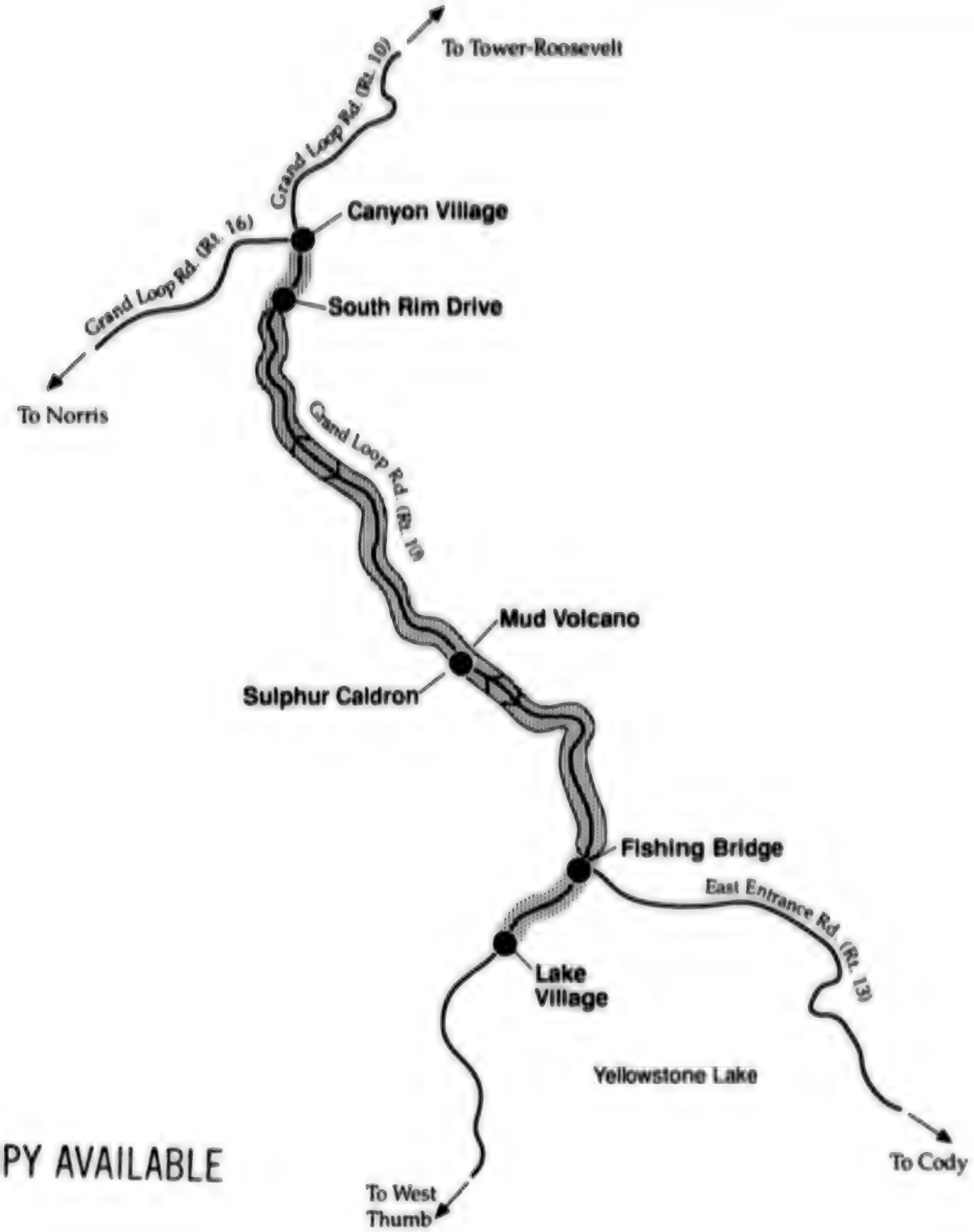
West Yellowstone to Grant Village (via Old Faithful)
VTS Alternative Definition

	Motor Coach Shuttle Bus Transit Alternative	
Shuttle Round Trip Route Length (miles)	109.0	
Shuttle Daily Access and Egress Boarding Capacity*	3,840	
Shuttle Fleet Size	20	
Shuttle Daily Vehicle Round Trips	40	
	Auto & RV	Bus
West Yellowstone Staging Area Total Parking Spaces Required	200	0
Existing Surplus Spaces Available	0	0
Net Parking Spaces Required	200	0
Grant Village Staging Area Total Parking Spaces Required	200	0
Existing Surplus Spaces Available (Grant Village Visitor Center)	78	0
Net Parking Spaces Required	122	0

* Assumes two boardings per visitor. Additional linked trips may occur.



HAYDEN VALLEY SEGMENT

Transit Alternatives

- Conventional or Large Shuttle Bus Transit
- Elevated Monorail Group Rapid Transit
- At-Grade Self-Propelled Rail Transit

LEGEND

▨ HAYDEN VALLEY TRANSIT ROUTE

○ ROAD CLOSED TO PRIVATE VEHICLE TRAFFIC

● TRANSIT STOP

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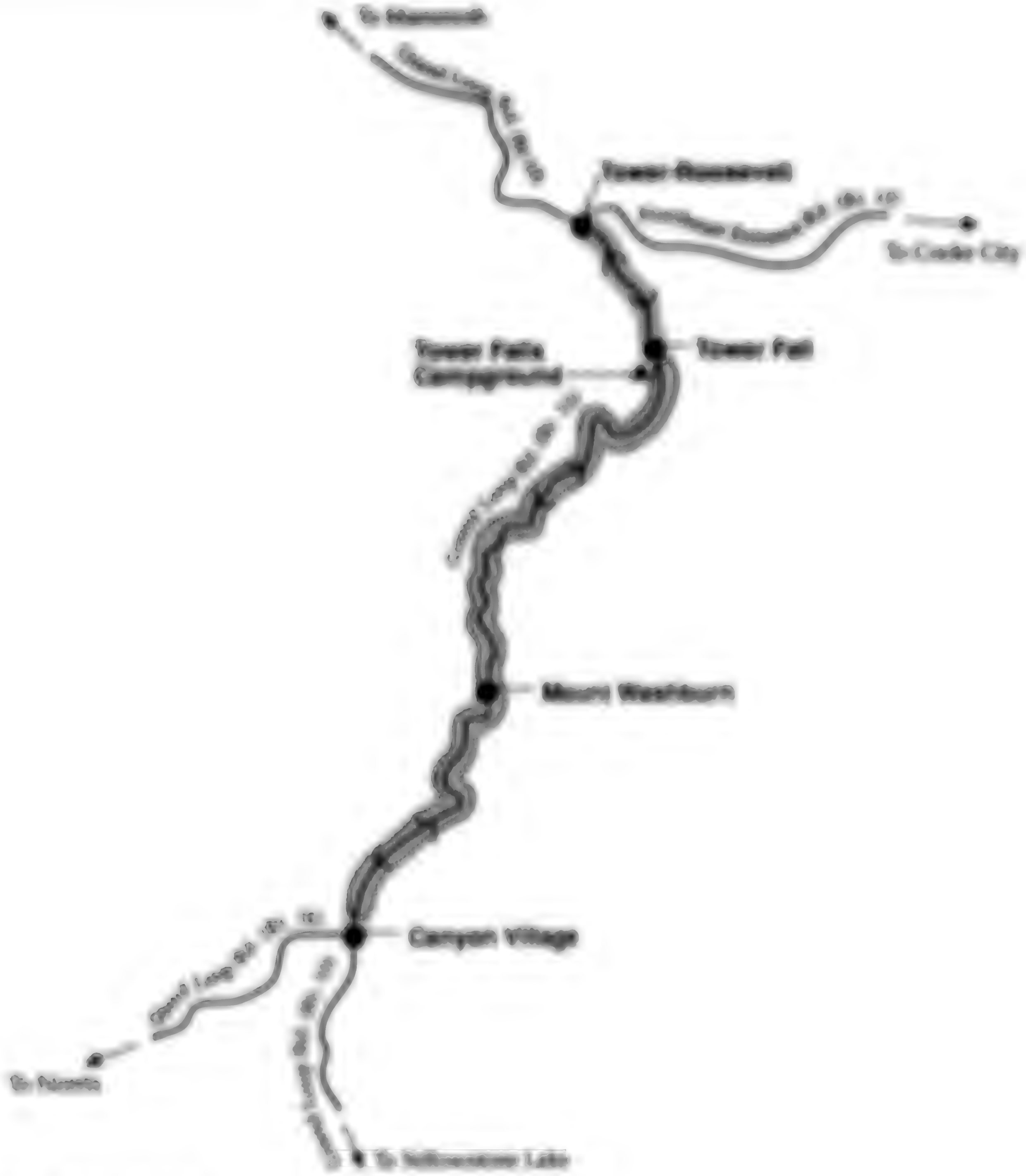
Hayden Valley (between Lake Village and Canyon) VTS Alternative Definition

	Conventional Shuttle Bus Transit Alternative		Articulated Shuttle Bus Transit Alternative		At-Grade Self-Propelled Rail Transit Alternative		Elevated Monorail Transit Alternative	
Shuttle Round Trip Route Length (miles)	34.5		34.5		34.5		34.5	
Shuttle Daily Access and Egress Boardings*	18,010		18,010		18,010		18,010	
Shuttle Fleet Size	60		54		44		30	
Shuttle Daily Vehicle Round Trips	300		200		160		106	
	Auto & RV	Bus	Auto & RV	Bus	Auto & RV	Bus	Auto & RV	Bus
Canyon Staging Area Total Parking Spaces Required	683	3	683	3	683	3	683	3
Existing Surplus Spaces Available (Canyon Village Visitor Center)	124	0	124	0	124	0	124	0
Net Parking Spaces Required	559	3	559	3	559	3	559	3
Lake Staging Area Total Parking Spaces Required	893	4	893	4	893	4	893	4
Existing Surplus Spaces Available	0	0	0	0	0	0	0	0
Net Parking Spaces Required	893	4	893	4	893	4	893	4

*** Assumes two boardings per visitor. Additional linked trips may occur.**

Note: Existing surplus parking spaces would only be available if not used by other optional transit services utilizing a Canyon Village staging area.

DUNRAVEN PASS SEGMENT



Transit Alternatives

- Conventional or Large Shuttle Bus Transit
- Cog Rail Transit

LEGEND

▨ DUNRAVEN PASS TRANSIT ROUTE

○ ROAD CLOSED TO PRIVATE VEHICLE TRAFFIC

● TRANSIT STOP

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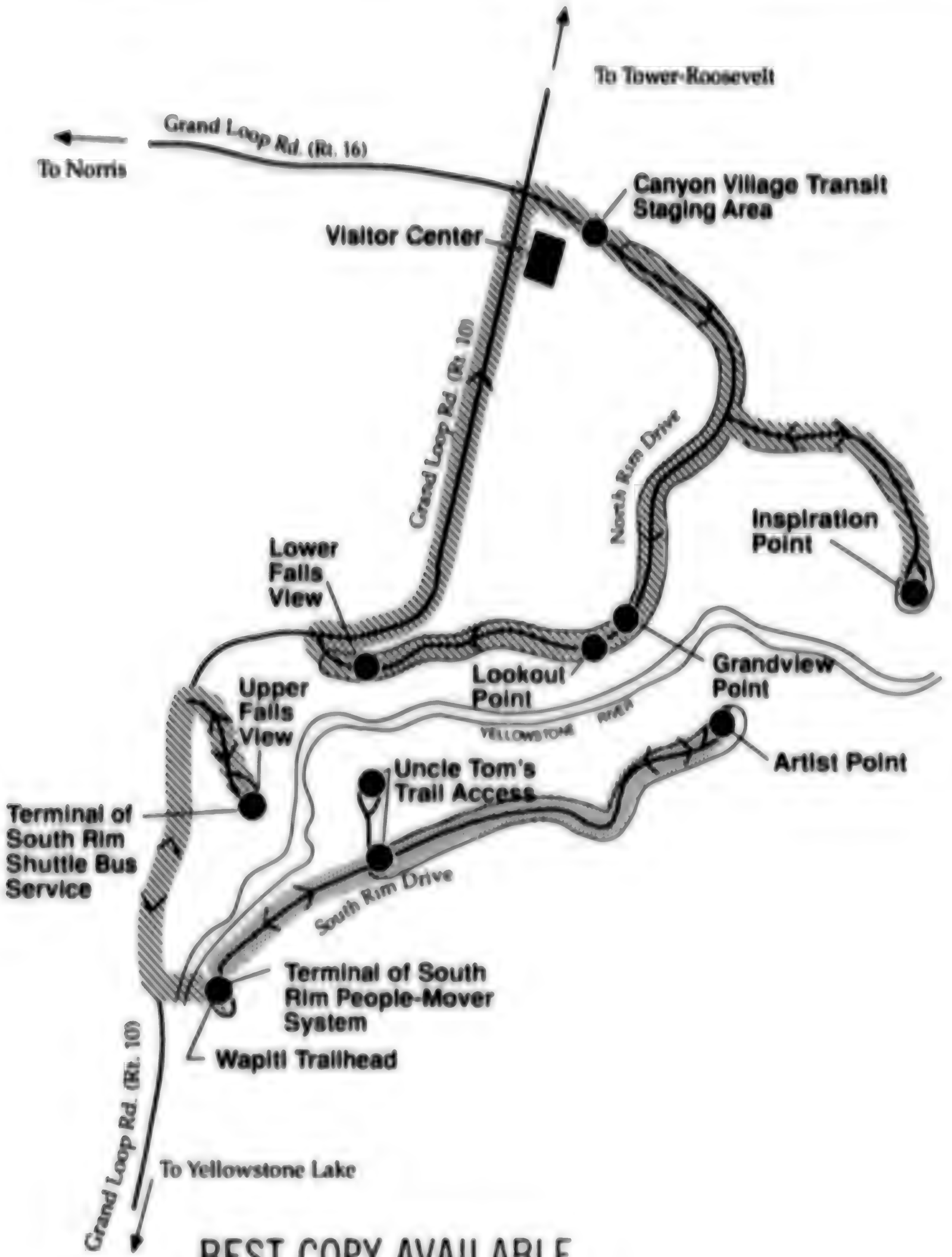
Dunraven Pass (between Canyon and Tower) VTS Alternative Definition

	Conventional Shuttle Bus Transit Alternative		**Large Shuttle Bus Transit Alternative**		**Cog Rail Transit Alternative**	
Shuttle Round Trip Route Length (miles)	38.0		38.0		38.0	
Shuttle Daily Access and Egress Boardings*	11,600		11,600		11,600	
Shuttle Fleet Size	60		48		32	
Shuttle Daily Vehicle Round Trips	200		160		106	
Canyon Staging Area Total Parking Spaces Required	**Auto & RV** 476	**Bus** 2	**Auto & RV** 476	**Bus** 2	**Auto & RV** 476	**Bus** 2
Existing Surplus Spaces Available (Canyon Village Visitor Center)	124	0	124	0	124	0
Net Parking Spaces Required	352	2	352	2	352	2
Tower Staging Area Total Parking Spaces Required	612	2	612	2	612	2
Existing Surplus Spaces Available	0	0	0	0	0	0
Net Parking Spaces Required	612	2	612	2	612	2

*** Assumes two boardings per visitor. Additional linked trips may occur.**

Note: Existing surplus parking spaces would only be available if not used by other optional transit services utilizing a Canyon Village staging area.



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CANYON VILLAGE AREA

Transit Alternatives

- North Rim Conventional Shuttle Bus Transit
- South Rim Conventional Shuttle Bus Transit
- South Rim Elevated Monorail Group Rapid Transit

LEGEND

▨ BUS TRANSIT ROUTE

▥ BUS OR ELEVATED MONORAIL TRANSIT ROUTE

○ ROAD CLOSED TO PRIVATE VEHICLE TRAFFIC

● TRANSIT STOP

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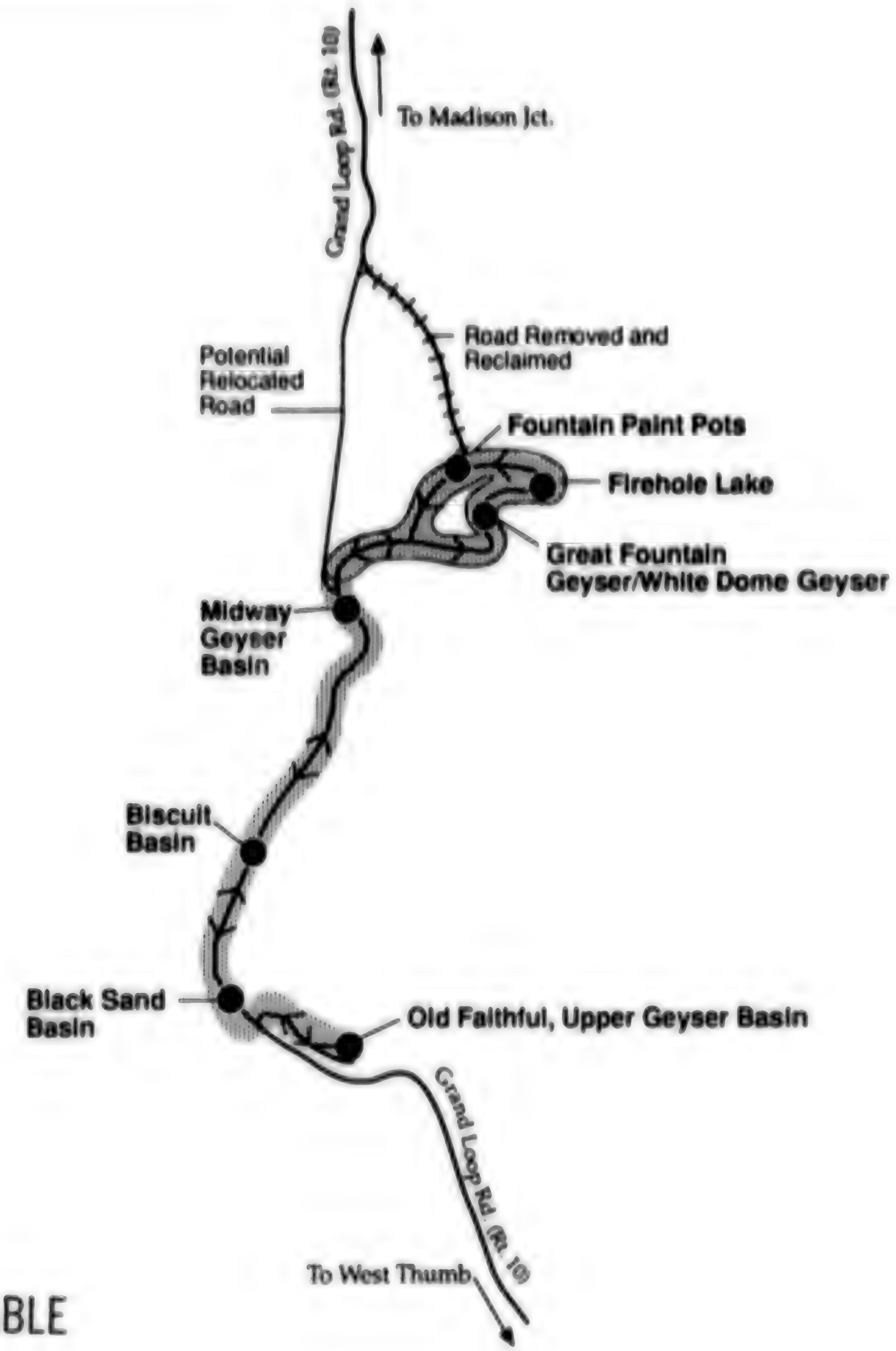
Canyon Village Area VTS Alternatives Definition

	North Rim Conventional Shuttle Bus Transit Alternative		South Rim Conventional Shuttle Bus Transit Alternative		South Rim Elevated Monorail Group Rapid Transit Alternative	
Shuttle Round Trip Route Length (miles)	5.20		6.37		3.12	
Shuttle Daily Access and Egress Boardings*	19,500		13,000		13,000	
Shuttle Fleet Size	14		11		4	
Shuttle Daily Vehicle Round Trips	300		200		92	
North Rim Staging Area Total Parking Spaces Required	Auto & RV 683	Bus 3	NA		NA	
Existing Surplus Spaces Available (Canyon Village Visitor Center)	124	0	NA		NA	
Net Parking Spaces Required	559	3	NA		NA	
South Rim Staging Area Total Parking Spaces Required	NA		Auto & RV 455	Bus 2	Auto & RV 379	Bus 2
Existing Parking Supplies Available (Upper Falls View, Wapiti Trailhead, Uncle Tom's Trail)	NA		260	0	178	0
Net Parking Spaces Required	NA		195	2	201	2

NA=Not Applicable

*** Assumes two boardings per visitor. Additional linked trips may occur.**

Note: Existing surplus parking spaces would only be available if not used by other optional transit services utilizing a Canyon Village staging area.



OLD FAITHFUL/ GEYSER BASIN AREA

Transit Alternatives

- Conventional or Articulated Shuttle Bus Transit

LEGEND

▨ OLD FAITHFUL/GEYSER BASIN TRANSIT ROUTE

⬭ ROAD CLOSED TO PRIVATE VEHICLE TRAFFIC

● TRANSIT STOP

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Old Faithful/Geyser Basin VTS Alternative Definition

	Conventional Shuttle Bus Transit Alternative		Articulated Shuttle Bus Transit Alternative	
Shuttle Round Trip Route Length (miles)	21.5		21.5	
Shuttle Daily Access and Egress Boardings*	15,000		15,000	
Shuttle Fleet Size	30		25	
Shuttle Daily Vehicle Round Trips	240		200	
	Auto & RV	**Bus**	**Auto & RV**	**Bus**
Old Faithful Staging Area Total Parking Spaces Required	875	3	875	3
Existing Surplus Spaces Available (Old Faithful West Lot)	141	0	141	0
Net Parking Spaces Required	734	3	734	3

*** Assumes two boardings per visitor. Additional linked trips may occur.**

EVALUATION SUMMARY CHART

West Yellowstone to Grant Village (via Old Faithful) VTS Alternative

	Voluntary Shuttle Bus
Visitor Transportation and Management	• Encourages use of lodging and visitor facilities outside park • Encourages reduction in private vehicle use • Not convenient for through travelers • Could encourage more visitation to Old Faithful by providing additional access from West Yellowstone • Could reduce traffic peaks after Old Faithful eruptions • May encourage new use patterns • Ridership is likely to be low
Visitor Experience	• Provides a means of visiting park without private vehicle • Lengthens stay for through travelers • Reduces Personal freedom to experience park • Gathers visitors into groups • Offers opportunity for narration/interpretation
Resource Impact	• Minor reductions in traffic and emissions • Potential to reduce traffic related disturbances to wildlife and roadside habitat • Offers opportunity to provide advance interpretation to reduce improper use of resources • Space requirements for parking and passenger loading facilities = 2.3 acres (West Yellowstone), 1.4 acres (Grant Village), 1,920 s.f. (Old Faithful) • Maintenance facility requirements = 21,966 square feet
Consistency With Park Service and Regional Planning Goals	• Encourages commercial development in West Yellowstone • Encourages development of visitor support services outside park • Requires staging area in West Yellowstone
Cost and Cost Effectiveness	• Cost-effectiveness depends on ridership level • Private sector could provide West Yellowstone staging area
Implementation	• Coordination with private sector and West Yellowstone required • Relatively easy to implement • Concessioner could operate • Large number of vehicle suppliers • Number of transportation employees = 46

EVALUATION SUMMARY CHART

Dunraven Pass VTS Alternatives

	Bus Alternatives	**Cog Railway Alternative**
Visitor Transportation and Management	• Diverts traffic from low volume portion of Grand Loop Road • Lengthens trips from northeast entrance to all locations except Mammoth • May increase traffic between Tower and Mammoth, Mammoth and Norris and Norris and Canyon	• Diverts traffic from low volume portion of Grand Loop Road • Lengthens trips from northeast entrance to all locations except Mammoth • May increase traffic between Tower and Mammoth, Mammoth and Norris and Norris and Canyon • May require detours of access to area during construction
Visitor Experience	• Provides alternative means of viewing segment of Grand Loop Road • Reduces traffic and roadside parking • Provides opportunity for narration and interpretation • Eliminates/reduces opportunity for direct wildlife viewing • Less personal freedom to experience park • Visitors gathered in groups • Buses produce noise and fumes	• Provides alternative means of viewing segment of Grand Loop Road • Reduces traffic and roadside parking • Provides opportunity for narration and interpretation • Eliminates/reduces opportunity for direct wildlife viewing • Less personal freedom to experience park • Visitors gathered in large groups • Cog rail vehicles produce noise and fumes • May provide visitor appeal • Has wilderness character
Resource Impact	• Reduces vehicle/wildlife conflicts • Reduces wildlife stress from human presence • Reduces road edge damage and social trails • Reduces vehicle travel and emissions • Some habitat loss at staging areas and along improved roadway • Short-term wildlife disruption during roadway upgrading and staging area construction • Conventional bus space requirements for parking and passenger loading facilities = 4.5 acres (Tower), 4.0 acres (Canyon) • Large bus space requirements for parking and passenger loading facilities = 6.5 acres (Tower), 4.0 acres (Canyon) • Conventional bus maintenance facility requirements = 1.5 acres • Large bus maintenance facility requirements = 1.5 acres	• Reduces vehicle/wildlife conflicts • Reduces wildlife stress from human presence • Eliminates road edge damage and reduces social trails • Reduces vehicle travel and emissions • Road could be removed/reclaimed • Some habitat loss at staging areas and along railway • Construction material extraction and hauling impacts • Short-term wildlife disruption during railway and staging area construction • Space requirements for parking and passenger loading facilities = 6.0 acres (Tower), 4.0 acres (Canyon) • Maintenance facility requirements = 1.0 acres • Unknown response of wildlife to crossing rails
Consistency With Park Service and Regional Planning Goals	• Could affect visitor use at Tower and northeast entrances • Reduces need for traffic enforcement and resource protection • Facilitates administrative travel	• Could affect visitor use at Tower and northeast entrances • Material extraction could affect areas outside park • Reduces need for traffic enforcement and resource protection • Facilitates administrative travel if road left in place
Cost and Cost Effectiveness	• Requires repair and upgrade of road • Less costly to construct • Higher operating costs	• High construction cost for railway • Lower operating cost than buses
Implementation	• Requires environmental documentation for staging areas • Shorter time to implement • Large number of potential suppliers • Concessioner could operate • Road construction crew housing required • Number of transportation employees = 130 (conventional bus) • Number of transportation employees = 102 (large bus)	• Requires environmental documentation for staging areas and railway • Requires five years or more to plan, design and construct • Requires specialized expertise for design, construction, operation and maintenance • Construction crew housing required • Small number of potential suppliers • Number of transportation employees = 82

EVALUATION SUMMARY CHART

Canyon Area VTS Alternatives

	North Rim Shuttle Bus	South Rim Shuttle Bus	South Rim People - Mover
Visitor Transportation and Management	• Eliminates private vehicle traffic on north rim drive • Concentrates visitor parking at Canyon Village • Could increase congestion in Canyon Village area • Spreads visitor demand at north rim over time • Allows transportation access to be matched to viewpoint carrying capacities • Allows sequence of visitor activities to be programmed	• Eliminates private vehicle traffic on south rim drive beyond Uncle Tom's Parking lot • Eliminates parking at Artist Point • Spreads visitor demand at South Rim over time • Allows transportation access to be matched to viewpoint carrying capacities • Allows sequence of visitor activities to be programmed	• Eliminates private vehicle traffic on south rim drive beyond Uncle Tom's Parking lot • Eliminates parking at Artist Point • Spreads visitor demand at south rim over time • Allows transportation access to be matched to viewpoint carrying capacities • Allows sequence of visitor activities to be programmed • Difficult to operate in snow • May require closure of access to area during construction
Visitor Experience	• Reduces traffic and roadside parking • Encourages short walking trips between viewpoints • Concentrates visitors into groups • Increases time required to view rim • Eliminates access problems related to inadequate viewpoint parking • Removes visual disruption of parking near rim • Buses could produce noise and fumes	• Reduces traffic and roadside parking • Encourages short walking trips between viewpoints • Concentrates visitors into groups • Increases time required to view rim • Eliminates access problems related to inadequate viewpoint parking • Removes visual disruption of parking near rim • Buses could produce noise and fumes	• Reduces traffic and roadside parking • Encourages short walking trips between viewpoints • Concentrates visitors into large groups • Increases time required to view rim • Eliminates access problems related to inadequate viewpoint parking • Offers unique viewing perspective • May disrupt views from points away from guideway • Removes visual disruption of parking near rim • Electrification system affects views from points along power line route • May provide visitor appeal • Requires vertical circulation at stations • Introduces urban element into environment • No exhaust
Resource Impact	• Reduction in roadside impacts from social pull-offs • Reduces vehicle emissions • Space requirements for parking and passenger loading facilities = 6.3 acres • Maintenance facility requirements = 15,539 square feet	• Reduction in roadside impacts from social pull-offs • Reduces vehicle emissions • Space requirements for parking and passenger loading facilities = 2.3 acres • Maintenance facility requirements = 12,637 square feet	• Reduction in roadside impacts from social pull-offs • Eliminates vehicle emissions and noise along rim • Material extraction and hauling for construction • Temporary noise, emissions and disruption during construction • Areas of habitat impact along alignment • Isolates visitor activity from surrounding environment • Space requirements for parking and passenger loading facilities = 2.4 acres • Maintenance facility requirements = 11,778 square feet
Consistency With Park Service and Regional Planning Goals	• Reduces need for traffic patrols and resource protection along rim	• Reduces need for traffic patrols and resource protection along rim	• Reduces need for traffic patrols and resource protection along rim • Novelty value could increase visitation demand in Canyon area • Electrification upgrades could affect areas inside and outside of park
Co. .nd Cost Effectiveness	• Requires parking expansion at Canyon Village and purchase of vehicle fleet	• Requires parking area expansion and purchase of vehicle fleet	• Requires parking expansion and guideway construction • Most costly to implement
Implementation	• Requires environmental documentation for parking expansion • Multiple suppliers • Concessioner could operate • Relatively short implementation time • Number of transportation employees = 31	• Requires environmental documentation for parking expansion • Multiple suppliers • Concessioner could operate • Relatively short implementation time • Number of transportation employees = 27	• Requires environmental documentation for parking expansion and guideway • Limited number of suppliers • Requires specialized skills for design, construction, operation and maintenance • Five years or more required to plan, design and construct • Number of transportation employees = 12

EVALUATION SUMMARY CHART

Old Faithful/Geyser Basin VTS Alternatives

	Shuttle Bus Service
Visitor Transportation and Management	◦ Provides visitor access to Geyser Basin if Grand Loop relocated to Fountain Freight Road ◦ Reduces traffic surge along Grand Loop Road after Old Faithful eruptions ◦ Organizes visitor flows in geyser area
Visitor Experience	◦ Provides alternative visitor experience from auto touring ◦ Eliminates need to search for parking at geyser viewing areas ◦ May reduce crowding of visitors at use areas near Old Faithful ◦ Less convenient for through travellers ◦ Facilitates hiking between shuttle stops ◦ Buses could produce localized fumes and noise
Resource Impact	◦ Reduces roadside damage and social trails from internal parking ◦ Reduces auto travel in thermal areas ◦ Allows removal and reclamation of a segment of road, and reclamation of wetlands ◦ No overall reduction in vehicle travel or emissions ◦ Conventional bus space requirements for parking and passenger loading facilities = 8.3 acres ◦ Articulated bus space requirements for parking and passenger and loading facilities = 8.3 acres ◦ Conventional bus maintenance facility requirements = 32,950 square feet ◦ Articulated bus maintenance facility requirements = 33,481 square feet
Consistency With Park Service and Regional Planning Goals	◦ Road through thermal area must be maintained and/or upgraded to accommodate bus traffic ◦ Eliminates portions of existing road and reclaims wetlands ◦ Facilitates relocation of Grand Loop Road to Fountain Freight Road
Cost and Cost Effectiveness	◦ Cost-effectiveness depends on actual ridership response ◦ Relatively low initial cost
Implementation	◦ May require environmental documentation if parking expansion needed at Old Faithful ◦ Large number of suppliers ◦ Concessioner could operate ◦ Relatively short time to implement voluntary system ◦ Mandatory system can not be implemented without relocation of Grand Loop Road ◦ Number of transportation employees = 65 (conventional bus) ◦ Number of transportation employees = 54 (articulated bus)

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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END

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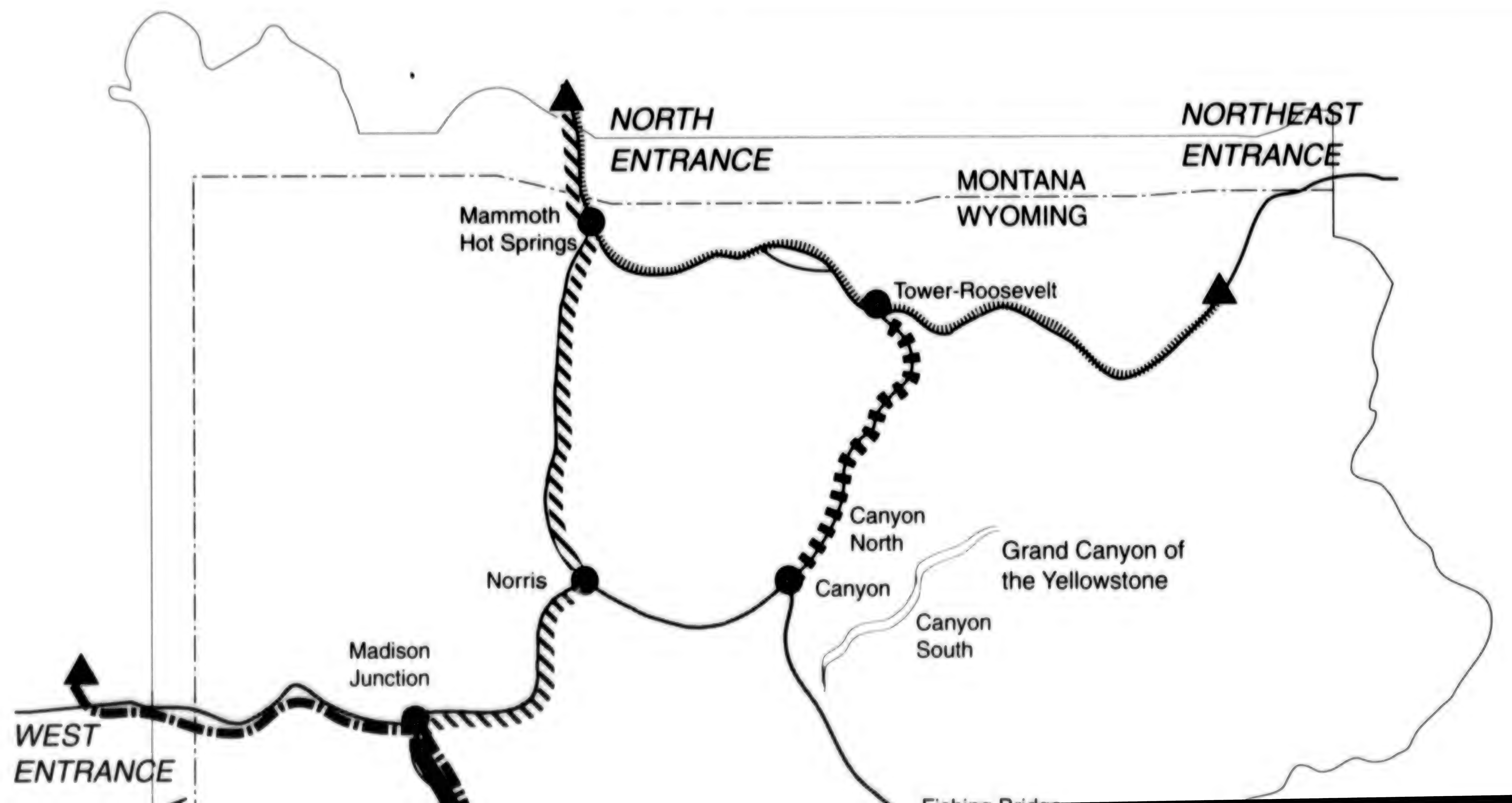
03/22/96

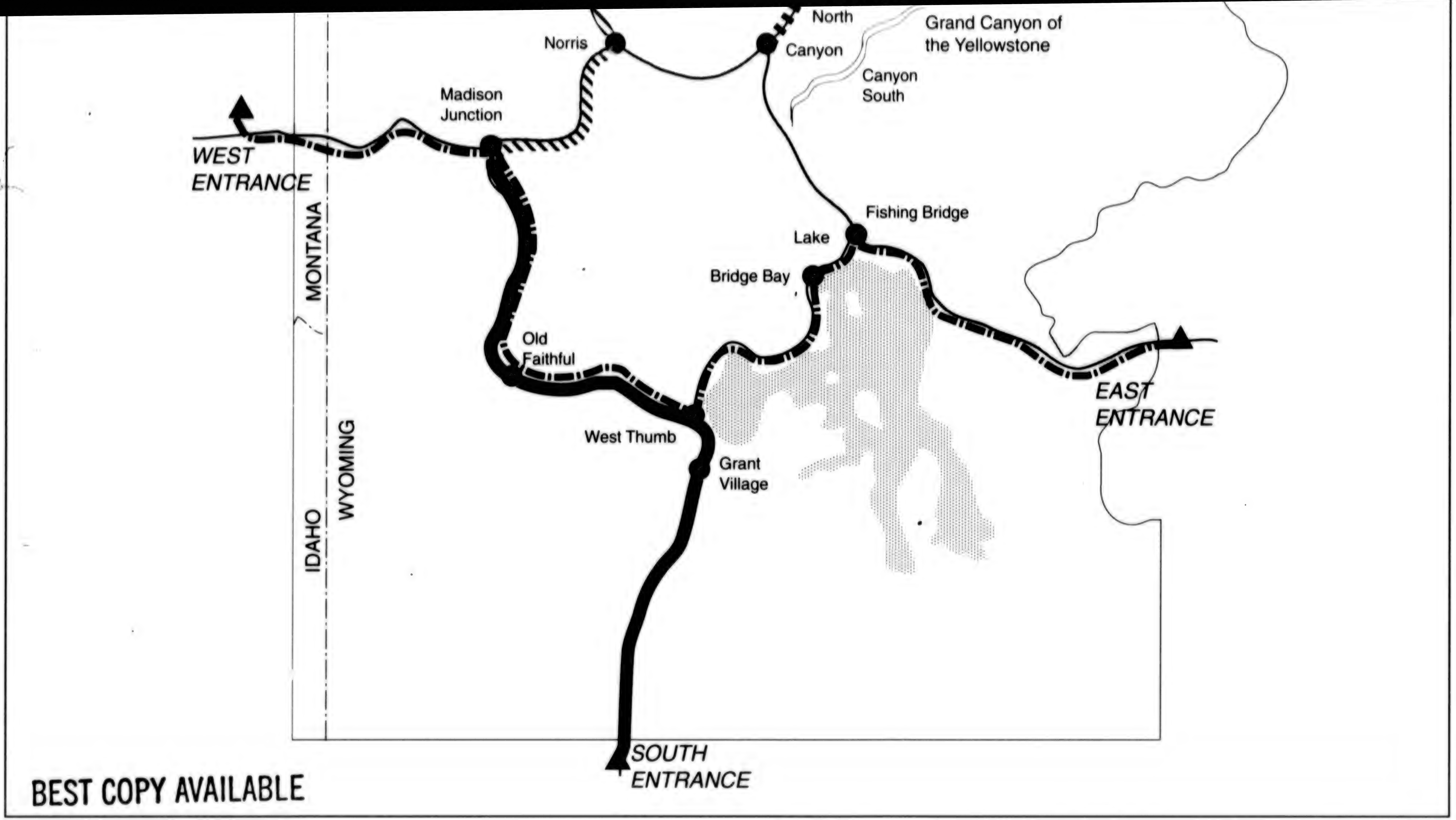
PARKWIDE VTS ALTERNATIVE



LEGEND

TRANSIT SERVICE BETWEEN:

- NORTHEAST AND NORTH ENTRANCES (via Tower)
- NORTH ENTRANCE AND MADISON JUNCTION (via Norris)
- WEST AND EAST ENTRANCES (via Canyon)
- EAST AND WEST ENTRANCES (via


North
Grand Canyon of the Yellowstone
Norris
Canyon
Canyon South
Madison Junction
WEST ENTRANCE
MONTANA
IDAHO
WYOMING
Fishing Bridge
Lake
Bridge Bay
Old Faithful
West Thumb
Grant Village
EAST ENTRANCE
SOUTH ENTRANCE
TRANSIT SERVICE BETWEEN:
NORTHEAST AND NORTH ENTRANCES (via Tower)
NORTH ENTRANCE AND MADISON JUNCTION (via Norris)
WEST AND EAST ENTRANCES (via Canyon)
EAST AND WEST ENTRANCES (via West Thumb)
SOUTH ENTRANCE AND MADISON JUNCTION (via Old Faithful)
TOWER-ROOSEVELT TO CANYON (via Dunraven Pass)
MAJOR ROADS
▲ REMOTE STAGING AREAS
● MAJOR STOP LOCATIONS AND TRANSFER POINTS
N

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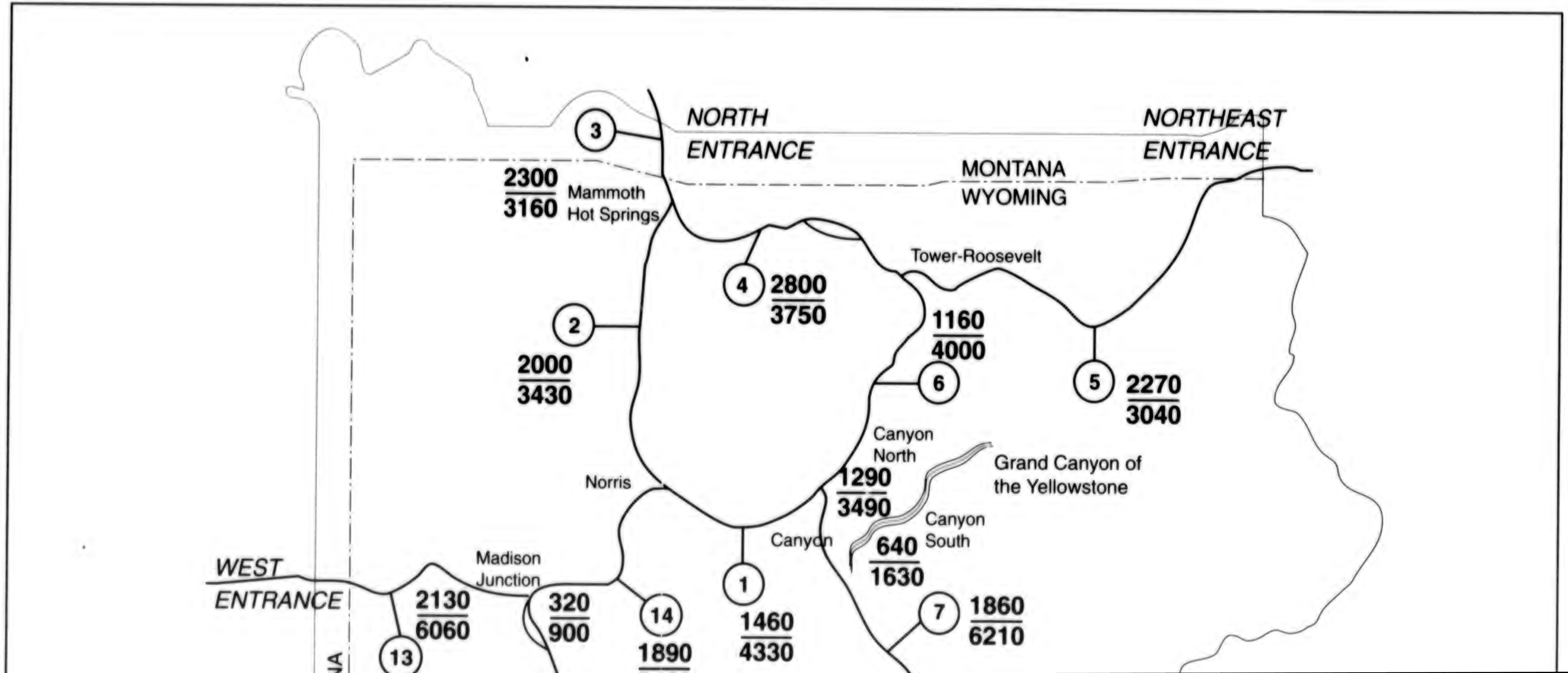
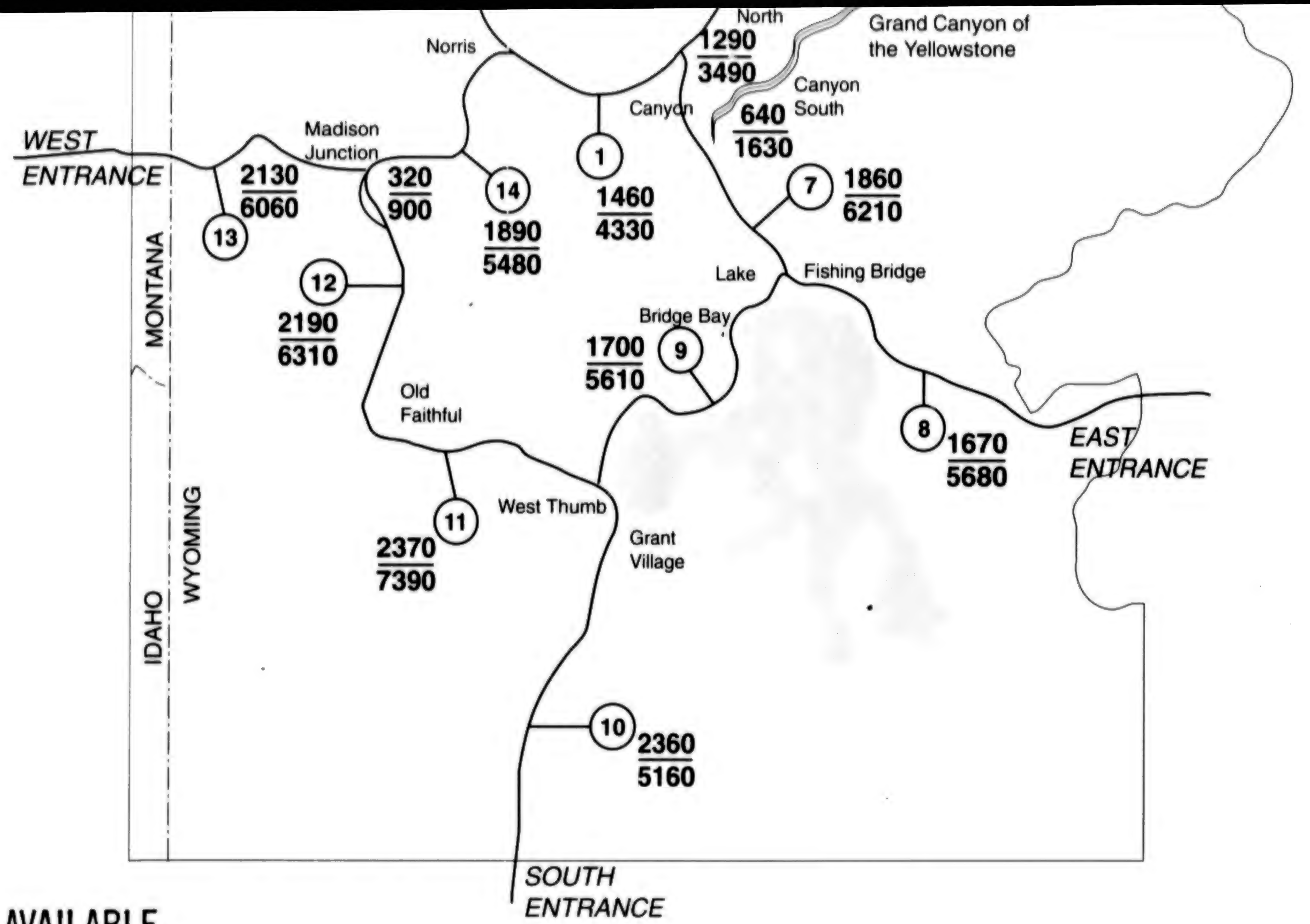
YELLOWSTONE
NATIONAL PARK

ALTERNATIVE TRANSPORTATION MODES FEASIBLITY STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC (APRIL 94) 101 20038B

YEAR 1992 AVERAGE DAILY TRAFFIC





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LEGEND

1670	ANNUAL ADT
5680	PEAK SEASON ADT (SUMMER)
—	MAJOR PARK ROADS

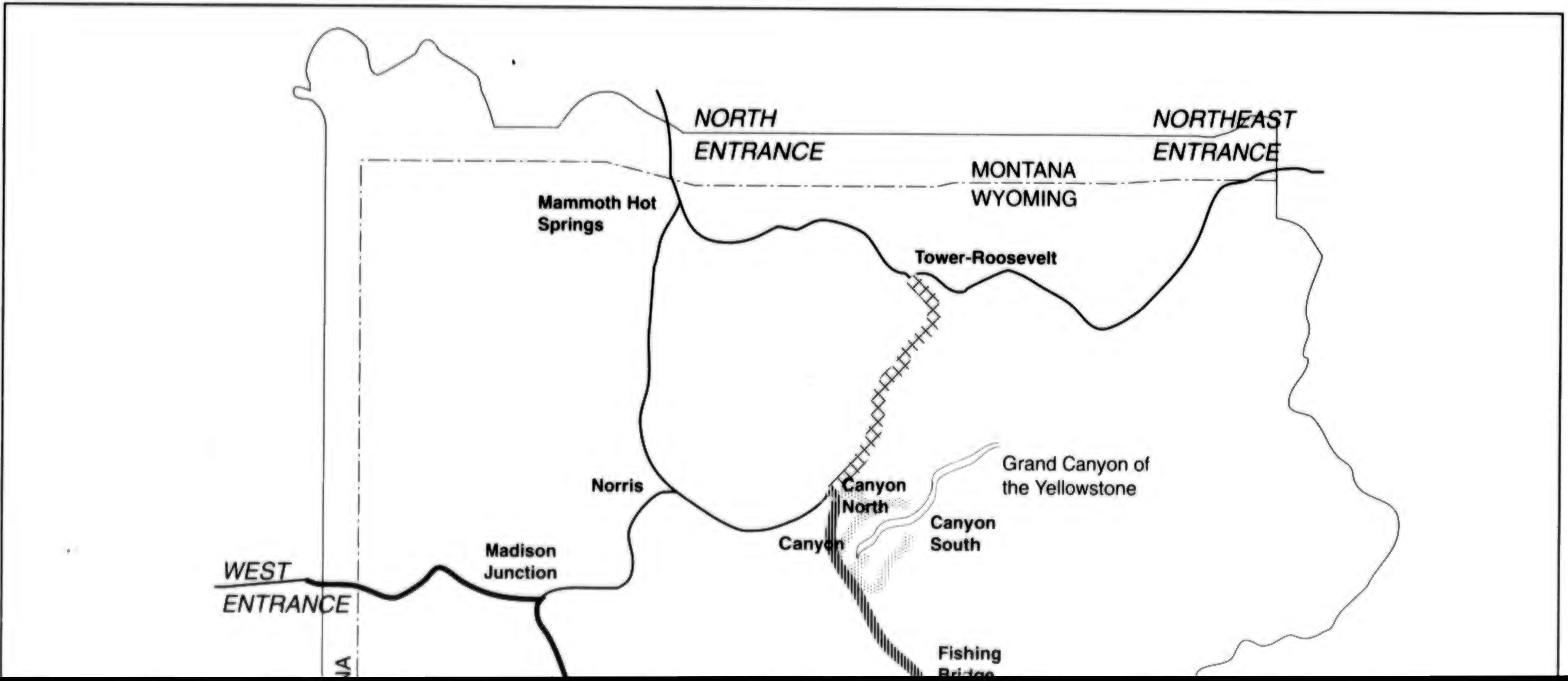
Source: National Park Service Traffic Count Program, 1992

N

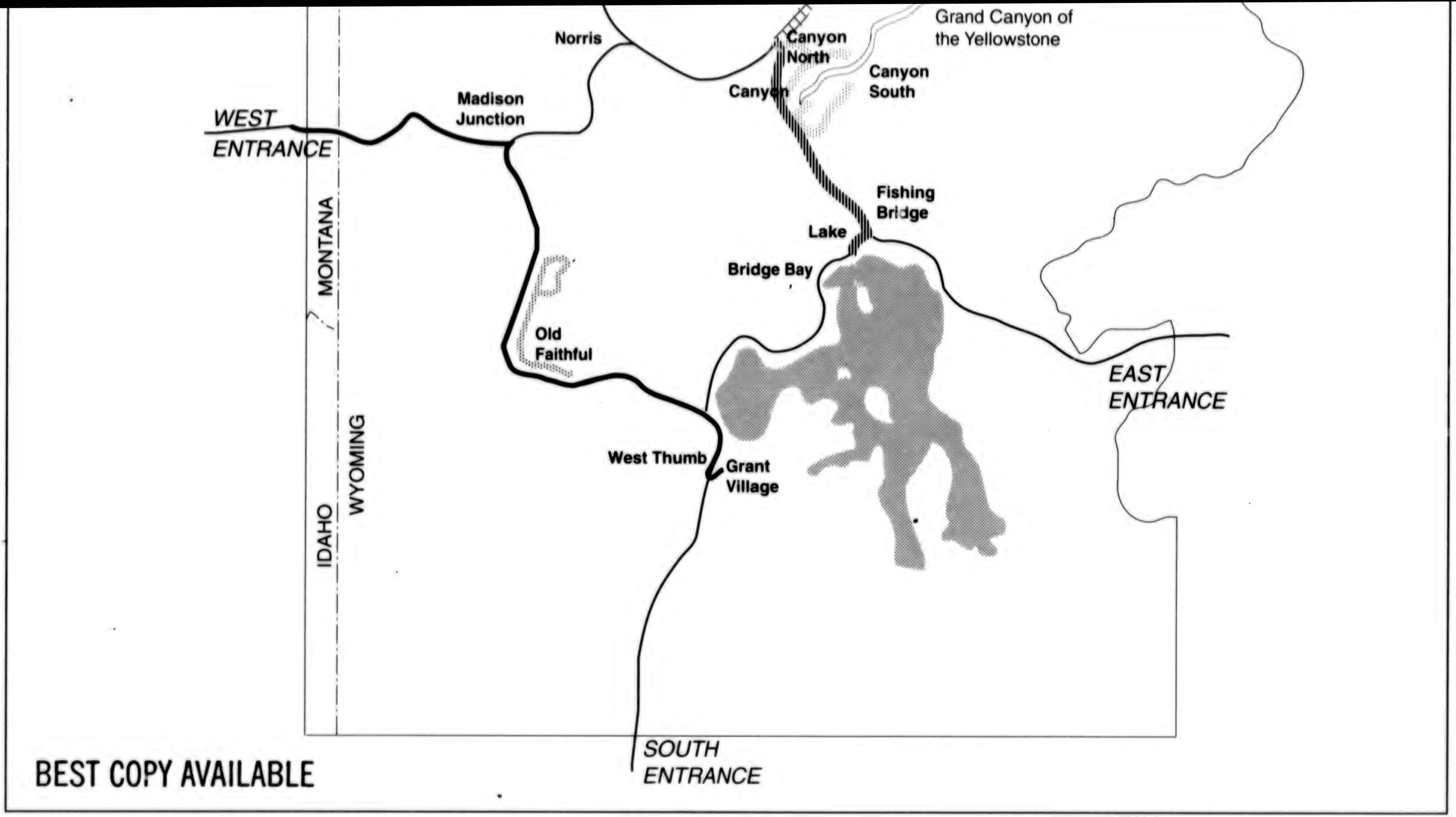
YELLOWSTONE
NATIONAL PARK

ALTERNATIVE TRANSPORTATION
MODES-FEASIBLITY STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC · SEP 93 · 101 · 20073A



CANDIDATE AREAS FOR TRANSIT SERVICE



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LEGEND

- ▬ WEST YELLOWSTONE TO GRANT VILLAGE (via Old Faithful) SEGMENT
- ░ OLD FAITHFUL AREA
- ▥ HAYDEN VALLEY SEGMENT
- ░ CANYON AREA
- XXXXX CANYON TO TOWER SEGMENT

N

YELLOWSTONE
NATIONAL PARK

ALTERNATIVE TRANSPORTATION
MODES FEASIBLITY STUDY

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE DSC SEP 93 101 20015A

EVALUATION SUMMARY CHART
Hayden Valley VTS Alternatives

		Self-Propelled Rail	Elevated People-Mover

EVALUATION SUMMARY CHART

Hayden Valley VTS Alternatives

	Bus Alternative	Self-Propelled Rail Alternative	Elevated People-Mover Monorail Alternative
Visitor Transportation and Management	○ Lengthens access time from Mammoth and Tower to Lake by private vehicle ○ Lengthens access time from Lake and West Thumb to Canyon, Norris, and Tower by private vehicle ○ Lengthens time of through trips between east and west entrances and north and east entrances ○ May increase traffic between Lake, West Thumb, and Madison Jct. ○ Provides opportunity to control visitor access to sensitive areas	○ Lengthens access time from Mammoth and Tower to Lake by private vehicle ○ Lengthens access time from Lake and West Thumb to Canyon, Norris, and Tower by private vehicle ○ Lengthens through trips between east and west entrances and north and east entrances ○ May increase private vehicular traffic between Lake, West Thumb, and Madison Jct. ○ Provides opportunity to control visitor access to sensitive areas ○ May require closure of access to area during construction	○ Lengthens access time from Mammoth and Tower to Lake by private vehicle ○ Lengthens access time from Lake and West Thumb to Canyon, Norris, and Tower by private vehicle ○ Lengthens through trips between east and west entrances and north and east entrances ○ May increase private vehicular traffic between Lake, West Thumb, and Madison Jct. ○ Provides opportunity to control visitor access to sensitive areas ○ Difficult to operate in snow and ice ○ Vertical circulation required at stations ○ May require closure of access to area during construction
Visitor Experience	○ Provides alternative means of viewing a segment of Grand Loop ○ Reduces traffic and roadside parking ○ Provides opportunity for narration and interpretation ○ Reduces convenience for some trips ○ Could lengthen stays in park ○ Eliminates/reduces opportunity for close-range wildlife contact ○ Less personal freedom to experience park ○ Visitors gathered in groups ○ Buses produce noise and fumes	○ Provides alternative means of viewing a segment of Grand Loop Road ○ Reduces traffic and roadside parking ○ Provides opportunity for narration and interpretation ○ Reduces convenience for some trips ○ Could lengthen stays in park ○ May provide visitor appeal ○ Could be consistent with wilderness character ○ Diesel engine produces noise and fumes ○ Visitors gathered in large groups ○ Eliminates/reduces opportunity for direct close-range wildlife contact ○ Less personal freedom to experience park	○ Provides alternative means of viewing a segment of Grand Loop Road ○ Reduces traffic and roadside parking ○ Provides opportunity for narration and interpretation ○ Reduces convenience for some trips ○ Could lengthen stays in park ○ May provide visitor appeal ○ Offers unique viewing perspective ○ Could conflict with wilderness character ○ Could affect landscape views from points off guideway ○ Electrification system affects views along power line route ○ Very low noise level ○ Eliminates/reduces opportunity for close-range wildlife contact ○ No exhaust ○ Visitors gathered in large groups ○ Introduces urban element into landscape ○ Less personal freedom to experience park ○ On-demand stops are not possible

	o Buses produce noise and fumes	o Eliminates/reduces opportunity for direct close-range wildlife contact o Less personal freedom to experience park	guideway o Electrification system affects views along power line route o Very low noise level o Eliminates/reduces opportunity for close-range wildlife contact o No exhaust o Visitors gathered in large groups o Introduces urban element into landscape o Less personal freedom to experience park o On-demand stops are not possible
Resource Impact	o Reduces vehicle/wildlife conflicts o Reduces wildlife stress from human presence in critical habitat area o Reduces road edge damage and social trails o Reduces vehicle travel and emissions o Some habitat loss at staging areas and maintenance base o Short-term wildlife disturbance during construction of staging areas o Conventional bus space requirements for parking and passenger loading facilities = 10.1 acres (Lake), 6.3 acres (Canyon) o Large bus space requirements for parking and passenger loading facilities = 10.1 acres (Lake), 6.4 acres (Canyon) o Conventional bus maintenance facility requirements = 2.0 acres o Large bus maintenance facility requirements = 1.5 acres	o Major reduction in vehicle/wildlife conflicts o Reduces wildlife stress from human presence in critical habitat area o Eliminates road edge damage and reduces social trail formation o Changes historic use of Grand Loop Road segment o Reduces vehicle travel and emissions o Wildlife disturbance during construction of staging areas and alignment o Alignment could be affected by archeological sites, thermal features, and seismic activity o Construction material extraction and hauling impacts o Some habitat loss at staging areas, maintenance base and along route o Road could be removed/reclaimed o Space requirements for parking and passenger loading facilities = 10.1 acres (Lake), 6.4 acres (Canyon) o Maintenance facility requirements = 2.8 acres	o Eliminates vehicle/wildlife conflicts o Reduces wildlife stress from human presence in critical habitat area o Eliminates road-edge damage and reduces social trail formation o Changes historic use of Grand Loop Road segment o Reduces vehicle travel, eliminates emissions o Wildlife disturbance during construction of staging areas and alignment o Alignment could be affected by archeological sites, thermal features, and seismic activity o Construction material extraction and hauling impacts o Road could be remover/reclaimed o Some habitat loss at staging areas, maintenance base and along route o Space requirements for parking and passenger loading facilities = 10.1 acres (Lake), 6.4 acres (Canyon) o Maintenance facility requirements = 2.0 acres
Consistency With Park Service and Regional Planning Goals	o Could affect visitor traffic through Cody, Wyoming, Cooke City, and Silvergate, Montana o Reduces need for traffic enforcement and resource protection o Facilitates administrative travel along road segment	o Could affect visitor traffic through Cody, Wyoming, Cooke City, and Silvergate, Montana o Novelty value could increase visitor use potential if road left in place o Construction materials extraction could affect areas outside park o Reduces need for traffic enforcement and resource protection o Facilitates administrative travel along road segment if road left in place	o Could affect visitor traffic through Cody, Wyoming, Cooke City, and Silvergate, Montana o Novelty value could increase visitor use potential o Electrification upgrades could affect areas inside and outside park o Construction materials extraction could affect areas inside and outside park o Reduces need for traffic enforcement and resource protection o Facilitates administrative travel along road segment if road left in place
Cost and Cost Effectiveness	o Least costly to implement o Highest operating costs	o High cost to implement o Moderate operating costs	o Most costly to implement o Lowest operating costs o Electrification upgrades could increase cost
Implementation	o Requires environmental documentation for	o Requires extensive environmental	o Requires extensive environmental

		segment if road left in place	resource protection Facilitates administrative travel along road segment if road left in place
Cost and Cost Effectiveness	Least costly to implement Highest operating costs	High cost to implement Moderate operating costs	Most costly to implement Lowest operating costs Electrification upgrades could increase cost
Implementation	Requires environmental documentation for staging areas and socio/economic impacts Relatively short time required to implement Large number of potential suppliers Number of transportation employees = 17 (conventional bus) Number of transportation employees = 116 (large bus)	Requires extensive environmental documentation for staging areas, alignment and socio/economic impacts Requires five years or more to plan, design and construct Requires specialized expertise for design and construction Construction crew housing required Small number of potential suppliers Number of transportation employees = 98	Requires extensive environmental documentation for staging areas, alignment and socio/economic impacts Requires five years or more to plan, design and construct Requires specialized expertise for design, construction, operations and maintenance Construction crew housing required Small number of potential suppliers Number of transportation employees = 68